Scientific Excellence • Resource Protection & Conservation • Benefits for Canadians
Excellence scientifique • Protection et conservation des ressources • Bénéfices aux Canadiens

ECONOMIC IMPACT ANALYSIS OF THE SALMONID ENHANCEMENT PROGRAM

Economic and Commercial Analysis

Report No. 44

Fisheries and Oceans Pêches et Océans

Canada

ECONOMIC IMPACT ANALYSIS OF THE SALMONID ENHANCEMENT PROGRAM

Fisheries Resource Analysis Unit
Economic and Commercial Analysis Division
Program Planning and Economics Branch
Pacific Region
Department of Fisheries and Oceans
Vancouver, British Columbia.
V6B 5G3

December, 1989

Report prepared by:

Marvin Shaffer & Associates Ltd.
White Rock, British Columbia

(Department of Fisheries and Oceans
contract no. FP 501-7-0274/A)

Economic and Commercial Analysis
Report No. 44

90-03151/

PUBLISHED BY:

Scientific Publications
Communications Directorate
Department of Fisheries and Oceans
Vancouver, British Columbia
V6B 5G3

(c) Minister of Supply and Services Canada. 1989.
Catalogue Number Fs 66-5/44E

ISBN 0-662-17465-8
ISSN 0843-5626

Correct citation for this publication:

Department of Fisheries and Oceans. 1989. Economic Impact Analysis of the Salmonid Enhancement Program. Economic and Commercial Analysis Report No. 44. 113 p. + app.

PUBLIÉ PAR:

Publications Scientifiques
Direction des Communications
Ministère des Pêches et des Océans
Vancouver, Colombie-Britannique
V6B 5G3

(c) Ministère des Approvisionnements et Services Canada. 1989.
N° de Catalogue Fs 66-5/44E
ISBN 0-662-17465-8
ISSN 0843-5626

Façon correcte de citer le titre:

Ministère des Pêches et des Océans. 1989. Economic Impact Analysis of the Salmonid Enhancement Program. Economic and Commercial Analysis Report N° 44. 113 p. + app.

ABSTRACT

Department of Fisheries and Oceans. 1989. Economic Impact Analysis of the Salmonid Enhancement Program. Economic and Commercial Analysis Report No. 44

The Salmonid Enhancement Program (SEP) was established in 1977 by the Federal and Provincial governments. Its primary goal was to double the population of salmonids in British Columbian waters. Today, enhancement activities make a significant contribution to Canada's annual catch of Pacific salmonids - a contribution that benefits the national economy. SEP has other goals too. Income, employment, and government revenues are generated as a result of both SEP expenditures and the incremental spending from the commercial, Native, and recreational fishing associated with the harvest of enhanced production.

The purpose of this report is to estimate the magnitude and significance of the economic impacts generated from SEP funding.

RÉSUMÉ

Ministère des Pêches et des Océans. 1989. Economic Impact Analysis of the Salmonid Enhancement Program. Economic and Commercial Analysis Report N° 44.

Le Programme de mise en valeur des salmonidés (PMVS) a été lancé en 1977 par les gouvernements fédéral et provincial. L'objectif principal était de doubler la population de salmonidés dans les eaux de la Colombie-Britannique. Aujourd'hui, les activités de mise en valeur apportent une contribution importante aux prises canadiennes annuelles de salmonidés du Pacifique, contribution qui profite à l'économie nationale. Le PMVS a également d'autres objectifs : les fonds affectés au PMVS et les dépenses supplémentaires des pêcheurs commerciaux, des autochtones et des pêcheurs sportifs qui récoltent une production plus abondante engendrent des revenus personnels, de l'emploi et des revenus nationaux.

Le rapport a pour but d'évaluer l'ampleur et l'importance des retombées économiques générées par le financement du PMVS.

EXECUTIVE SUMMARY

Economic Impact Analysis of the Salmonid Enhancement Program

The Salmon Enhancement Program (SEP) was established in 1977 by an agreement of the Federal and provincial governments. Its primary goal has been to stabilize and increase salmonid stocks. It has also served as a stimulus to the economy, providing income and employment opportunities throughout the province of British Columbia.

SOCIAL AND ECONOMIC GOALS OF SEP

The federal/provincial agreement establishing SEP stated that the enhancement of salmonid stocks was considered a means of achieving important economic and social objectives, specifically:

- to increase income in B.C. and Canada as a whole
- to create new employment opportunities
- to improve economic opportunities for native people
- to foster economic development in outlying communities and regions
- to increase and improve recreational opportunities

In March of 1987, the federal government announced the continuation of SEP funding for the next five years. The government will spend approximately $42 million per year, ensuring the continued operation of existing facilities and allowing for the expansion and construction of new ones.

ENHANCEMENT TECHNIQUES

SEP uses a variety of enhancement techniques including:

- hatcheries
- spawning channels
- rearing ponds and channels
- fishways and fish holders
- incubation units
- habitat improvements
- lake enrichment

Hatcheries and spawning channels account for most of the expenditures on SEP.

The construction and operation of SEP facilities will directly provide fisheries-related and construction-related job opportunities in British Columbia. An estimated 650 jobs per year, mostly in the operation of SEP facilities, will be created by the program itself.

In addition to this direct employment, purchases of goods and services for the SEP facilities and purchases by the employees hired by SEP will provide indirect or spin-off jobs in other sectors of the economy. For example, employment will increase at quarries to provide gravel for spawning channel construction. Local businesses in the vicinity of SEP projects will increase their activity as they supply goods and services to the facilities and to SEP workers. These spin-off effects are estimated to generate over 600 jobs per year in British Columbia and another 200 jobs per year elsewhere in Canada.

In total, the contruction and operation of SEP facilities will directly and indirectly provide over 1400 jobs per year over the next five years.

But these are just the immediate effects. The operation of SEP facilities will increase salmonid production over the long term. It is estimated that when today's facilities reach full production, they will contribute approximately 6 million fish per year to the west coast commercial, recreational and native fisheries. This, in turn, will provide income, employment and other economic benefits.

For example, SEP's contribution to the commercial fishery is estimated to provide some $100 million in wage and profit income and 500 harvesting and processing jobs per year. Spin-off effects in supplier industries are estimated to provide another $70 million in income and 1500 jobs per year. SEP's contribution to the recreational fisheries is estimated to provide, directly and indirectly, some $17 million in income and 350 jobs per year. SEP's contribution to native fisheries is estimated to provide $17 million in food benefits per year.

Though small relative to the Canadian economy as a whole, these impacts are significant, particularly in a province like British Columbia which has been subject to high unemployment in recent years. Indeed the significance is heightened by the fact that many of the jobs provided by SEP will occur in outlying areas where employment opportunities are scarce. Over 80% of SEP spending on facility construction and operations will be made in areas outside the Lower Mainland. Also, the increase in salmonid production will benefit small coastal communities heavily dependent on commercial, recreational or native fisheries.

The jobs in the outlying areas not only provide immediate income benefits, but also valuable work experience. For example, SEP's Community Economic Development Program allows communities and native

bands to operate their own hatcheries. Often these activities become an important source of pride and confid- ence fostering further economic activities in the community.

Taxpayers also benefit from the jobs and income provided by SEP. The increased economic activity means higher income, sales and other tax revenues for government. At the same time, it means lower unemployment insurance and social assistance costs. Provincial government revenues and tax savings are estimated at $1.5 million per year over the next five years and $5 million per year when SEP reaches full production. Federal revenues and cost savings are estimated at $7 million per year over the next five years and $18 million per year when SEP reaches full production. The federal government also receives license fees, and surplus fish and egg sale revenues estimated at $7 million per year.

SEP will produce fish, important in its own right. But it will also serve important economic objectives benefitting workers, business and taxpayers alike.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Background	1
1.2	Purpose of Report	1
1.3	Methodology	4
1.4	Report Outline	8
2.0	DESCRIPTION OF SEP PROGRAM AND POSSIBLE INCREASED PROVINCIAL ENHANCEMENT FUNDING	10
2.1	SEP	10
2.1.1	Program Expenditures	10
2.1.2	Expenditures by Enhancement Technique	12
2.1.3	Fish Production	14
2.2	Increased Provincial Funding	16
2.2.1	Program Expenditures	16
2.2.2	Expenditures by Enhancement Technique	17
2.2.3	Fish Production	19
3.0	INCOME AND EMPLOYMENT IMPACTS	21
3.1	Sources of Impacts	21
3.2	SEP	21
3.2.1	Impacts of SEP Expenditures	21
3.2.2	Impacts of Incremental Downstream Activity: Existing Cost Recovery	25
3.2.3	Impacts of Incremental Downstream Activity: Full Cost Recovery	37
3.3	Increased Provincial Funding	46
3.3.1	Impacts of Provincial Expenditures	46
3.3.2	Impacts of Incremental Downstream Activity	48
4.0	SUB-REGIONAL IMPACTS	56
4.1	Sub-Regional Impacts of SEP	57
4.1.1	SEP Program Expenditures by Sub-Region	57
4.1.2	Economic Impacts of SEP Program by Selected Sub-Region	57
4.1.3	Economic Impacts of SEP-Related Downstream Activity by Sub-Region	60
4.2	Sub-Regional Impacts of Increased Provincial Funding	66
4.2.1	Provincial Expenditures by Sub-Region	66
4.2.2	Economic Impacts of Provincial Expenditures by Sub-Region	67
4.2.3	Economic Impacts of Provincial Enhancement-Related Downstream Activity by Sub-Region	67

4.3 Importance of SEP and Increased Provincial Funding to Sub-Regional Economies 71
4.3.1 SEP 71
4.3.2 Increased Provincial Funding 73

5.0 OTHER ECONOMIC IMPACTS OF ENHANCEMENT 74

5.1 Recreational Fisheries Investment Impacts 75
5.2 Aquaculture Investment Impacts 76
5.3 Human Resource and Community Economic Development . 78

6.0 ECONOMIC SIGNIFICANCE OF EMPLOYMENT IMPACTS 79

6.1 Magnitude vs. Significance of Employment Impacts . . 79
6.2 Estimation Methods 80
6.3 Distribution of Enhancement-Related Employment by Region and Occupation 83
6.3.1 Regional Distribution of Employment Impacts . 84
6.3.2 Occupational/Skill Distribution of Employment Impacts 85
6.4 Existing and Projected Labour Market Conditions in British Columbia 86
6.5 Specific Estimates 92

7.0 NET GOVERNMENT REVENUE IMPACTS 94

7.1 Sources of Government Revenue or Reduced Costs . . . 94
7.2 Government of Canada Revenues 96
7.2.1 SEP 96
7.2.2 Increased Provincial Funding 102
7.3 Government of British Columbia Revenues 104
7.3.1 SEP 104
7.3.2 Increased Provincial Funding 106
7.4 Net Financial Impacts of SEP and Increased Provincial Funding on Federal and B.C. Governments . 109
7.4.1 Government of Canada 109
7.4.2 Government of B.C. 110
7.4.3 Summary of Net Financial Benefits 111

APPENDIX A: Per Dollar Breakdown of Expenditures on Enhancement Activity

APPENDIX B: Per Dollar Breakdown of Incremental Downstream Revenues and Expenditures

APPENDIX C: Summary of Regional Income Multiplier Methodology

1.0 INTRODUCTION

1.1 Background

In March 1987, the Federal Government approved funding of approximately $40 million per year for the continuation of the Salmonid Enhancement Program over the 1987/88 to 1991/92 period. The funding will be directed to the operation and maintenance of existing facilities, some expansions of capacity and administration and support services. This SEP funding will allow DFO to maintain and in some cases increase salmonid production from existing facilities, as well as increase production as a result of new or expanded facilities.

Additional enhancement activity and production may take place if additional funding sources are secured. In particular, the provincial government is considering increasing salmonid enhancement funding. In 1987/88, the British Columbia Government spent some $1.5 million on enhancement activities. It is currently considering increasing its enhancement spending. For purposes of this study it is assumed provincial funding will increase by approximately $3.0 million per year by 1988/89. This funding would be used to develop new enhancement projects.

1.2 Purpose of this Report

Both federal SEP and increased B.C. Government enhancement funding will generate income and employment impacts as a result of the

program expenditures themselves and the incremental commercial fishing, processing and recreational-related spending associated with the enhanced fish production. In addition, income and employment will be indirectly generated in other industries as a result of inter-industry linkages, the respending of increased household income and possible complementary private sector investment effects.

These impacts can be very beneficial to workers in a province like British Columbia, with its chronically high unemployment rate. They can also benefit government, by increasing income and other tax revenue and reducing income assistance spending.

The purpose of this report is to outline the magnitude and significance of the economic impacts that will be generated by federal SEP and, if approved, increased provincial government funding.(1) Estimates of the direct and indirect(2) income and employment generated in Canada as a whole, in British Columbia and in selected west coast regions are presented for the SEP and the possible increased B.C. Government funding. Assessment of the significance of these impacts is presented in terms of the probability of hiring persons who would otherwise be unemployed and also, in terms of their effect on federal and provincial government revenues and expenditures.

---

(1) This report does not estimate the economic impact of existing provincial enhancement funding.

(2) Impact studies often separate inter-industry from household income respending spin-off effects, with the former referred to as indirect and the latter as induced impacts. In this report the term indirect is meant to capture both of these types of spin-off effects.

The analysis is based on the SEP program plan as set out in DFO's November, 1987 submission to Federal Treasury Board, SEP Proposed Five Year Plan 1987/88 - 1991/92, Federal Expenditures. The projects for increased provincial funding were identified by provincial and federal officials. The SEP Evaluation Model and EPIC (Enhancement Planning Information Control) data base were relied upon throughout the analysis for detailed data on enhancement projects and downstream effects.

Because of current uncertainty regarding federal government cost recovery for SEP, the implications of two scenarios are considered: one with and the other without increased cost recovery. The with or full cost recovery scenario assumes fees and charges covering all production-oriented expenditures will be levied. These amount to some $28.5 million per year. The without scenario (i.e. existing cost recovery) assumes that the current provisions will continue, resulting in levies of some $7 million per year.

It should be noted that the purpose of the quantitative estimates in this report is to illustrate the general magnitude and significance of the impacts, rather than to develop precise estimates. Given the uncertainty surrounding many of the factors underlying the impact estimates (e.g., the effect of commercial catch on vessel investment; the effect of recreational catch on effort; future price and wage levels; future management and allocation policies; the incidence and effects of cost recovery), precise values would be impossible to determine.

1.3 Methodology

Economic impact analysis basically involves identifying firstly, the income and employment generated directly as a result of an initial increase in spending or activity in the economy and, secondly, the income and employment indirectly generated as a result of all subsequent spin-off spending and activity.

To identify the direct income and employment impacts of SEP and possible increased B.C. Government spending, estimates of the income and employment content of the program expenditures and of the incremental, "downstream" commercial fishing, processing and recreational-related spending due to the enhanced production are developed. The estimates are derived from expenditure and revenue breakdowns which reflect the mix of goods and services the program and incremental downstream activities entail.

Direct income is defined as the gross (pre-tax) wages, profits and other factor incomes embodied in the program and downstream expenditures. Direct employment is defined as the number of person years associated with the share of total direct expenditures spent on labour. The direct impacts are reported for Canada as a whole, British Columbia and selected coastal regions, with the geographic assignment based on location of residence for impacts accruing to individuals and location of business for impacts accruing to firms.

To estimate the indirect income and employment impacts in British Columbia and Canada as a whole, input-output models are used. Input-output models indicate the demand for any one good or service resulting from an increase in the output of another. With such models one can estimate the total increase in demand for all goods and services associated with the purchases of the goods and services required for the enhancement program and for the incremental downstream fishing activities. With the "closed" version of these models one can also estimate the total increase in the demand for all goods and services associated with the respending of increased household incomes.(1). The income and employment generated as a result of all of these increased demands for goods and services define the indirect impacts. For the analysis of Canada-wide impacts, Statistics Canada's national input-output model is used. For the analysis of B.C. impacts, the provincial government's input-output model (which is an adapted version of Statistics Canada's inter-regional input-out model) is used.

Multiplier estimates are used to analyze the indirect impacts retained within specific sub-regions. Multipliers are coefficients which indicate the total increase in regional income induced by a $1 direct increase in household income. They are based primarily on the estimated share of household spending which remains in the region. While less sophisticated than input-output models (in that they do not

---

(1) Defined as wages and salaries, supplementary labour income and net income of unincorporated businesses.

completely capture inter-industry linkages) they do provide a reasonable indication of the magnitude of the spin-off effects that accrue to regions of different size and economic structure.

The input-output models and multiplier estimates capture the indirect impacts associated with the demand for input goods and services and the respending of household incomes. However, they do not, in themselves, capture the impacts associated with private sector investment that may be induced as a result of enhancement.(1) For example, they do not capture the possible impacts on marina development that an enhancement-induced new recreational fishery may encourage, or the impacts on aquaculture investment that enhancement research, technology and egg production may support.

The difficult part in analysing such activities is determining exactly what private sector investment is attributable to SEP or increased B.C. Government funding. Therefore, for purposes of this report, the potential impacts of such investments are described with examples. The analysis does not estimate the total impact that can be expected, but does serve to illustrate the nature of impacts that may occur.

---

(1) This is the case unless an investment response to increased output or income is explicitly assumed in the specification of "first round" expenditures. For the harvesting sector such an investment response is assumed and, therefore, harvesting sector investment impacts are captured in the analysis.

Estimatiny the income and employment generated from program expenditures, incremental downstream activity and possible new complementary private sector investment serves to measure the magnitude of the economic impacts. However, to understand their significance one must consider the state of the economy in which these impacts are likely to occur. In particular one must consider whether the income and employment are accruing to persons or other factors of production which would otherwise be unemployed. If they do accrue to persons who would otherwise be unemployed, the impacts provide significant economic benefits to the workers and to government. If they do not, the impacts serve more to reallocate employment opportunities from one sector to another, rather than create new income, employment and tax revenue in the economy.

Estimates of the probability of hiring workers who would otherwise be unemployed are available from the SEP Model for SEP and provincial enhancement projects and for downstream harvesting and processing. These estimates are based on previous studies of the employment status of SEP workers and on the basis of equations which assume the greater the unemployment rate, the greater the probability will be.(1) Current and historical unemployment rates by industry, occupation and region are also reviewed and compared to the types and locations of jobs generated directly and indirectly by federal and

---

(1) See Haveman, R. and J. Krutilla, Unemployment, Idle Capacity and the Evaluation of Public Expenditures: National and Region Analysis, Baltimore 1968.

provincial enhancement funding in order to assess the validity of current SEP Model probability assumptions and to develop probability estimates for the economy-wide indirect impacts of the programs.

On the basis of this analysis, estimates of the employment benefits and government revenue impacts of SEP and increased B.C. Government funding are made. Employment benefits are defined by the labour income impacts multiplied by the probability of hiring persons who would otherwise be unemployed. Government revenue impacts are estimated as the sum of direct cost recovery revenues, plus incremental income, sales and excise tax revenues, plus reduced income assistance or unemployment insurance payments, all calculated separately for the federal and provincial jurisdictions. The net cost of enhancement programs to both levels of government is also estimated.

1.4 Report Outline

The report is divided into seven sections. In section 2, federal SEP and possible increased B.C. Government expenditures and downstream fishery production impacts are described in detail. In section 3, estimates of the direct and indirect income and employment impacts generated within British Columbia and Canada as a whole are developed by source of impact. In section 4, estimates of the direct and indirect impacts accruing to selected west coast regions within the province are outlined. In section 5, other economic impacts of SEP, not elsewhere estimated, (e.g., complementary private sector

investments) are discussed. The economic significance of the employment impacts are discussed in section 6. Government revenue impacts and the net financial impact of enhancement are presented in section 7.

2.0 DESCRIPTION OF SEP PROGRAM AND POSSIBLE INCREASED PROVINCIAL ENHANCEMENT FUNDING

2.1 SEP

2.1.1 Program Expenditures

As shown in Table 2.1, federal SEP expenditures over the 1987-91 period will total about $208 million in constant 1987 dollars.(1) Expenditures will decline slightly in real terms over the 5 year period from about $42 million in the 1987 fiscal year to $40 million in 1991. This slight decrease occurs because only the employee wage, salary and benefit component of the approved funding (comprising about 30% of the total) is expected to increase with inflation.

Expenditures on the operation and maintenance of existing facilities average about 60% of total program expenditures over the 5 year period. Construction and operating expenditures for new and expanded facilities average about 10% of total expenditures over the period. Administration, planning, and other SEP technical support activities, such as fisheries management studies and economic and scientific research, account for the remaining 30% of expenditures.

---

(1) The 1987-1991 funding for SEP was approved in current dollars with the exception of wages, salaries, and related employee benefits. For purposes of this economic impact analysis the approved funding was transformed into constant dollars by SEP Program Planning and Economics staff, assuming a 4% annual rate of inflation.

TABLE 2.1

SEP Expenditures

by Fiscal Year

(millions 1987$)

Type of Expenditure	1987	1988	1989	1990	1991	TOTAL	%
1. Planning, Administration & Other Support*							
Sub-Total	13.1	12.6	12.4	12.2	11.4	61.7	29.6
2. New or Expanded Facilities							
Construction	3.5	4.4	3.5	3.1	2.8	17.3	
Operating	0.1	0.5	1.0	1.4	1.0	4.0	
Sub-Total	3.6	4.9	4.5	4.5	3.8	21.3	10.2
3. Existing Facilities							
Major Maintenance**	2.8	2.7	2.6	2.6	2.5	13.2	
Operating	22.4	22.3	22.3	22.5	22.5	112.0	
Sub-Total	25.2	25.0	24.9	25.1	25.0	125.2	60.2
TOTAL	41.9	42.5	41.8	41.8	40.2	208.2	100.0

*Support for both existing and new/expanded facilities.

**Includes major renovation, repair or replacement expenditures.

2.1.2 Expenditures by Enhancement Technique

SEP expenditures will support the operation and maintenance of the following facilities.

- 30 major hatcheries, spawning channels and flow control/fishway projects;
- 18 small rehabilitation, side channels;
- 8 lake fertilization projects;
- 27 small community economic development hatcheries;
- numerous small public involvement projects.

A number of new projects or expansions of existing facilities will also be undertaken, including:

- expansion of 5 hatcheries;
- 12 semi-natural spawning channel improvement projects;
- a number of pilot projects and minor habitat rehabilitation projects;
- two new lake fertilization projects subject to the results of some preliminary investigations;
- expansion and alteration of several small community economic development hatcheries to increase their production and effectiveness.

The breakdown of SEP expenditures by enhancement technique, excluding support activities,(1) are summarized in Table 2.2. As shown in the table, hatcheries and spawning channels comprise 93% of direct fish production-related expenditures. In order of importance, lake fertilization, flow control fishways and other small rehabilitation projects account for the remaining expenditures.

TABLE 2.2

Breakdown of SEP Production-Related Expenditures (1987-1991)* by Enhancement Technique

(millions 1987$, % in parentheses)

Enhancement Technique	Construction		Operation		TOTAL	
Hatcheries	13.7	(44.9)	96.2	(83.0)	111.1	(75.9)
Spawning Channels	13.9	(45.6)	12.7	(11.0)	25.5	(17.4)
Flow Control/ Fishways	2.7	(8.9)	0.1	--	2.8	(1.9)
Lake Fertilization	--		6.6	(5.7)	6.6	(4.5)
Other	0.2	(0.6)	0.3	(0.3)	0.5	(0.3)
TOTAL	30.5	(100)	115.9	(100)	146.4	(100)

*Excludes SEP support activities.

(1) For purposes of simplicity SEP support activities were not allocated to specific techniques. If this were done the pattern of expenditures by technique would still be similar to that shown in Table 2.2

2.1.3 Fish Production

The total annual harvestable production (i.e., adult production net of escapement requirements) resulting from all SEP projects at full target production, expected after 1996, is estimated to reach approximately 6 million pieces or almost 20 million kg per year.(1) Harvestable production from existing SEP facilities will account for about 86% of the total production. New or expanded facilities will contribute the remaining 14%.

The estimated distribution of the harvestable production by species and fishery (commercial, recreational, native food and rack fisheries(2)) is shown in Table 2.3. As shown in the table, the commercial sector is expected to catch about 82% of total SEP harvestable production, with native food, recreational and rack fisheries taking an estimated 10%, 5%,and 3%, respectively.

---

(1) Based on DFO's EPIC data base. Note the estimates exclude a very small amount of cutthroat production from SEP hatcheries (about 15,000 pieces). Also, because the EPIC data base reflects recent historical harvesting patterns and exploitation rates, it may not fully capture future commercial and sport catches, particularly in terminal fisheries.

(2) Hatchery gate harvests.

TABLE 2.3

SEP Target Harvestable Production

by Species and Fishery*

('000 Pieces)

User Group	Sockeye	Chum	Pink	Coho	Chinook	TOTAL	%
Commercial	1,565.3	1,467.4	1,199.4	355.0	387.6	4,974.7	82.3
Recreational	--	0.5	0.1	157.5	136.6	294.7	4.9
Native Food	147.2	54.2	4.3	165.3	206.3	577.3	9.6
Rack	n.a.	15.3	n.a.	159.1	20.0	194.4	3.2
TOTAL	1,712.5	1,537.4	1,203.8	836.9	750.5	6,071.1**	100.0

*Excludes very small number of cutthroat. The number is not large enough to significantly affect the table results.

**Includes about 30,000 pieces of steelhead for which estimates by fishery are unavailable.

Source: EPIC data base and SEP Evaluation Model.

Of the total commercial catch attributable to SEP Continuation, it is estimated that 84% would be taken by the net fleet and 16% by the troll fleet.

2.2 Increased Provincial Funding

2.2.1 Program Expenditures

The B.C. Government is currently considering an increase in its salmon enhancement funding. The level and mix of increased provincial funding is uncertain at this time. However, based on discussions with officials from SEP and the B.C. Ministry of Agriculture and Fisheries, it is assumed for this report that the Province could increase its enhancement expenditures by an average of some $3.0 million annually in constant 1987 dollars over the fiscal years 1988-1992. These expenditures would be over and above current provincial enhancement funding of about $1.5 million annually. Expenditures would fluctuate over this period due to variations in construction spending and the phasing-in of operations. As shown in Table 2.4 proposed provincial spending over the 5 year period totals about $15 million.

Expenditures on the construction of new or expanded facilities account for about 55% of total expenditures over the 5 year period. Operating costs for these facilities comprise 33% of total expenditures over the period. Planning and administrative support activities comprise the remaining 12% of expenditures.

TABLE 2.4

Increased Provincial Enhancement Expenditures

by Fiscal Year

(millions 1987$)

Type of Expenditure	1988	1989	1990	1991	1992	TOTAL	%
1. Planning, Administration and Other Support*	0.6	0.3	0.4	0.2	0.4	1.9	12.5
2. Construction	0.3	2.4	2.3	0.5	2.9	8.3	54.6
3. Operating	0.3	0.9	1.2	1.2	1.4	5.0	32.9
TOTAL	1.2	3.6	3.9	1.9	4.6	15.2	100.0

*Includes an allowance in 1988 for design and planning. For subsequent years estimated at 10% of total construction and operating costs.

2.2.2 Expenditures by Enhancement Technique

For purposes of this analysis the following 15 enhancement projects were selected by officials from SEP and the Marine Resources Branch of the B.C. Ministry of Agriculture and Fisheries as being the most likely to be undertaken if additional provincial funding were available.

- 3 small hatchery facilities;
- 8 small spawning and side channel projects, 2 of which are expansions or additions to existing facilities;
- 2 lake fertilization projects;
- 2 stream improvement/transplanting projects.

In addition, the increased provincial expenditures will also fund the design, planning and administration and other support activities related to the above projects.

The breakdown of the increased provincial expenditures by enhancement technique excluding support activities are summarized in Table 2.5. As shown in the table, hatcheries account for 35% of total fish production-related spending over the 5 year period, spawning channels for 42%, lake fertilization 10% and other projects such as stream improvements, 13%.

TABLE 2.5

Breakdown of Provincial Production-Related Expenditures (1988-1992) by Enhancement Technique*

(millions in 1987$, % in parentheses)

Enhancement Technique	Construction	Operation	TOTAL
Hatcheries	2.2 (26.5)	2.4 (49.1)	4.6 (34.8)
Spawning Channels	4.9 (59.0)	0.6 (12.2)	5.5 (41.8)
Lake Fertilization	- (-)	1.3 (26.5)	1.3 (9.8)
Other	1.2 (14.5)	0.6 (12.2)	1.8 (13.6)
TOTAL	8.3 (100.0)	4.9 (100.0)	13.2 (100.0)

*Excludes support activities.

2.2.3 Fish Production

The total annual harvestable production resulting from the proposed additional provincial projects described above is expected to reach approximately 600,000 pieces or about 1.3 million kg per year at full target production.(1)

The estimated distribution of the harvestable production by species and type of fishery is shown in Table 2.6. As shown in the table, the commercial sector is expected to catch 94% of total harvestable production from provincial projects, with native food and recreational fisheries taking an estimated 5% and 1%, respectively.(2) Rack fisheries are assumed to comprise a negligible proportion of total harvestable production. Most of the commercial catch attributable to provincial projects would be taken by the net fleet.

---

(1) Based on EPIC data base.

(2) Alternative program configurations are being considered which would place more emphasis on species such as chinook which are more likely to be caught in sport fisheries.

Table 2.6

Target Harvestable Production from Provincial Projects

by Species and Fishery

('000 pieces)

User Group	Sockeye	Chum	Pink	Coho	Chinook	TOTAL	%
Commercial	178.7	0.4	365.0	0.3	17.6	562.0	93.9
Recreational	--	--	--	0.4	8.8	9.2	1.5
Native Food	17.5	--	1.3	0.2	8.2	27.2	4.5
TOTAL	196.2	0.4	366.3	0.9	34.6	598.4	100

Source: EPIC data base and SEP Evaluation Model.

3.0 INCOME AND EMPLOYMENT IMPACTS

3.1 Sources of Impacts

SEP and increased B.C. Government funding will generate income and employment impacts as a result of:

- the program expenditures themselves;
- the incremental commercial fishing, processing and recreational fishing activity due to the enhanced production; and
- complementary private sector investments.

The direct and indirect impacts associated with each of these sources is discussed below, first for SEP and then for increased B.C. Government funding. All dollar estimates are in constant 1987 dollars. Complementary private sector investments in the sport fishing and aquaculture industries, are discussed in section 5 below.

3.2 SEP

3.2.1 Impacts of SEP Expenditures

(a) Direct Impacts:- In Appendix A, detailed breakdowns of the different components of the SEP expenditures are provided. The breakdowns indicate the mix of goods, services and wages and salaries per dollar of spending on construction and major maintenance (by type of facility); project operations (by type of facility); and planning,

administration and other support services. As shown in these tables, SEP construction and major maintenance expenditures will directly generate an estimated $.28 to $.44 in wage and salary income per dollar of spending, depending on the type of facility. SEP operating expenditures will directly generate an estimated $.27 to $.53 in wage and salary income per dollar of expenditures, again depending on the type of facility. SEP planning, administration and other support expenditures will directly generate an estimated $.50 in wage and salary income per dollar of expenditures.

Multiplying the income content estimates by the corresponding expenditures in each category of spending indicates the estimated total direct income impact of SEP program expenditures. Dividing the direct income impact by average income per person year indicates the employment impacts. The results are summarized in Table 3.1. Over the 1987-91 period, total SEP expenditures of about $208 million are estimated to generate some $100 million in direct wage and salary income and about 3,295 PYs in terms of direct employment.

TABLE 3.1

SEP Program Expenditures

Cumulative Direct Impacts (1987-1991)

Type of Expenditure	Total Expenditures (millions 1987$)	Direct Income (millions 1987$)	Direct Employment (PYs)*
Construction and Major Maintenance	30.5	10.1	290
Operation	116.0	59.2	2,090
Planning, Administration & Other Support	61.7	30.9	1,030
TOTAL	208.2	100.2	3,295

*Assumes average annual income/PY of $35,000 for construction and $30,000 for program operations and support activities, derived from current assumptions in SEP Model.

(b) Indirect Impacts:- Indirect impacts (i.e., the income and employment generated by enhancement expenditures in subsequent rounds of inter-industry and household respending) were estimated for British Columbia with the B.C. Ministry of Economic Development's input-output model and, for Canada, by means of the impact matrix for Statistics Canada's national input-output table.(1)

---

(1) The B.C. model is based on Statistics Canada's most recent inter-regional input-output model which uses 1979 I-O coefficients. The adapted B.C. model was chosen since Statistics Canada's version has some internal inconsistencies with respect to the balancing of inter-industry supply and demand within the province. The national impact matrix, which was not available for 1979, is based on the 1981 national I-O table in Statistics Canada, Catalogue #15-201. The results for B.C. and Canada produced by these models are considered to be sufficiently consistent for purposes of this study given the basic similarity of the models and the stability of I-O coefficients over short periods of time.

The estimated indirect impacts of SEP expenditures in B.C. and Canada by category of enhancement activity are presented in Table 3.2. As shown in the table, SEP expenditures will generate indirectly in B.C. a total of $118 million in income and almost 3,200 PYs of employment over the 1987-1991 period.

For Canada as a whole, the indirect impact of SEP expenditures over the 5 year period totals an estimated $195 million and 4,100 PYs of employment.

TABLE 3.2

SEP Program Expenditures

Cumulative Indirect Impacts (1987-1991)

British Columbia and Canada

Type of Expenditures	Indirect Income (millions 1987$)		Indirect Employment (PYs)	
	B.C.	Canada*	B.C.	Canada*
Construction and Major Maintenance	19.7	30.9	470	650
Operation	62.5	104.9	1,565	2,200
Planning, Administration & Other Support	36.0	59.7	1,125	1,255
TOTAL	118.2	195.5	3,160	4,105

*Includes indirect impact in B.C.

(c) Total Direct and Indirect Impacts:- The sum of direct and indirect impacts of SEP expenditures over the 1987-1991 period in B.C. by type of enhancement expenditure are summarized in Table 3.3. Over this period, the direct and indirect income and employment impact of SEP expenditures in B.C. totals $218 million and 6,500 PYs, respectively. The results for Canada, presented in Table 3.4, show that SEP expenditures generate direct and indirect impacts of about $296 million in income and 7,400 PYs in employment.

3.2.2 Impacts of Incremental Downstream Activity: Existing Cost Recovery

(a) Direct Impacts:- In Appendix B, detailed cost, profit and income breakdowns per dollar of harvesting and processing sector revenues, rack sale revenues and recreational expenditures are shown. The breakdowns were developed for existing and for full cost recovery scenarios.(1) The results immediately following assume existing levels of cost recovery; the full cost recovery scenario is dealt with in section 3.2.3.

The cost and income breakdowns indicate that with existing cost recovery) an estimated $.67 in wage, salary and profit income

---

(1) See Appendix B for a more complete discussion of these breakdowns and their derivation.

TABLE 3.3

SEP Program Expenditures

Total Direct and Indirect Impacts (1987-1991)

British Columbia

Type of Expenditure	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Construction and Major Maintenance	30.5	10.1	19.7	29.8	290	470	760
Operation	116.0	59.2	62.5	121.7	1,975	1,565	3,540
Planning, Administration & Other Support	61.7	30.9	36.0	66.9	1,030	1,125	2,155
TOTAL	208.2	100.2	118.2	218.4	3,295	3,160	6,455

TABLE 3.4

SEP Program Expenditures

Total Direct and Indirect Impacts (1987-1991)

Canada

Type of Expenditure	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Construction and Major Maintenance	30.5	10.1	30.9	41.0	290	650	940
Operation	116.0	59.2	104.9	164.1	1,975	2,200	4,175
Planning, Administration & Other Support	61.7	30.9	59.7	90.6	1,030	1,255	2,285
TOTAL	208.2	100.2	195.5	295.7	3,295	4,105	7,400

will be generated for every dollar of incremental harvesting sector revenues;(1) an estimated $.70 in income per dollar of processing sector revenues; an estimated $.36 in income per dollar of rack sale revenues, and an estimated $.40(2) in income per dollar of recreational expenditures.

To determine the total direct impacts associated with the incremental downstream activity, these per dollar impact estimates must be multiplied by the corresponding revenues and expenditures that the SEP program is expected to generate at full production.(3) The question that this raises, however, is to what extent will harvesting sector revenues, processing sector revenues, rack sale revenues, and recreational expenditures increase as a result of the production supported by SEP.

With respect to commercial harvesting and processing sector revenues, as indicated in section 2 (see Table 2.3), it is estimated that SEP will support the commercial harvest of some 5 million pieces of salmon per year when enhancement facilities are operating at full target production. Given the species mix, and likely mix of processed products and markets for that fish, it is estimated that the total

---

(1) The harvesting income coefficient excludes the proportion of revenue that will be reinvested by fishermen on vessel upgrading and other items. See Appendix B for discussion.

(2) Represents income embodied in recreationists' purchases.

(3) Note that the imputed income value of Native food harvests produced by SEP is not included in the estimate of total direct and subsequent indirect downstream impacts.

wholesale revenues will be $150 million per year. The share accruing to the harvesting sector is estimated at 62% or $93 million, with the remaining 38% or $57 million accruing to the processing sector.(1)

With respect to rack sales, it is estimated that SEP will result in an additional 194,000 pieces of fish being caught in rack fisheries (see Table 2.3) at full target production. Based on the average product mix and wholesale prices for these types of fisheries, this will give rise to an estimated $880,000 in wholesale revenues annually.(2)

Finally, with respect to the recreational sector, it is estimated that SEP will result in an additional 300,000 pieces of salmon per year being caught in the recreational fishery (see Table 2.3 in section 2). The amount of recreational activity and expenditures this incremental catch will generate is difficult to determine. This will depend on whether the additional fish support new areas for recreational fishing or simply improve success rates, and on the response of how recreational fishermen to these changes.

It is assumed in this analysis that most of the SEP production is caught in existing fisheries and that response of recreational

---

(1) Source: SEP Evaluation Model.

(2) Source: SEP Program Planning and Economics Branch.

fishermen to an increase in catch and success rate in existing fisheries is less than proportional. In other words, it is assumed that the additional 300,000 pieces caught by recreational fishermen, representing an increase of about 33% over what they would catch without SEP,(1) will not give rise to a corresponding percentage increase in recreational fishing days. Rather, consistent with recent studies on recreational effort, it is assumed that the response would be one-quarter to one-half that, i.e., the 33% increase in catch will give rise to an approximate 8% to 16% increase in recreational angler days.(2) Given the levels of recreational fishing effort that could be expected without SEP,(3) this would mean that the incremental recrea-

---

(1) Total tidal resident and non-resident sport catch in 1986 is estimated at about 1.2 million pieces. Therefore, tidal sport catch, excluding contribution of existing SEP facilities, would be about 900,000 pieces.

(2) See Marvin Shaffer & Associates (MSA) Ltd., "Analysis of the Economic Efficiency Impacts of Alternative Recreational and Gulf Troll Chinook Allocations in the Gulf of Georgia", for DFO, 1987. Also, Elizabeth J. Andrews and James E. Wilen, "Angler Response to Success in the California Salmon Sportfishery: Evidence and Management Implications." In the MSA study it was estimated that a 50,000 piece change in the recreational chinook catch (representing a 22% change in the 1985 catch level) would result in a 5% to 10% change in effort. Fisheries managers indicated the low end of this range was most likely. The percentage change in effort response compared to the percentage change in catch therefore was 5/22 to 10/22 or .23 to .45. In Andrews and Wilen it was also concluded that effort response was less than proportional to changes in abundance and catch. They estimated that a 14% change in catch would give rise to a 7% change in effort. Therefore, the elasticity of effort with respect to catch would be approximately .5.

(3) Estimated at about 1.8 million angler days for resident and non-resident tidal sport fishing in 1986. Source: Program Planning and Economics Branch.

tional catch would increase recreational fishing effort by up to 290,000 angler days per year. On the basis of an estimated average spending per day of approximately $70[1], the expenditure impact would be up to $20.3 million per year.[2]

Table 3.5 summarizes the incremental downstream revenue and expenditure impacts, as discussed above, along with the direct income and employment impacts they imply. Income impacts, which include profit as well as wage and salary income, are derived by multiplying the appropriate income content estimates in Appendix B by incremental downstream revenue and expenditures. Employment impacts are based on the estimated wage and salary component of the income impact.

As shown in the table, the incremental downstream activity due to SEP will annually generate a total of up to $120 million in direct income[3] and up to 670 PYs in employment when SEP facilities are operating at full target production. Note that the relatively low direct employment impact in downstream activities is due to the assumption that existing capacity in the fishing industry, particularly

---

(1) Source: "Sport Fishing in B.C. Tidal Waters," Communications Directorate, DFO, 1985.

(2) For simplicity only the upper bound of recreation impacts are presented throughout the report.

(3) The estimate of direct income excludes existing government revenues from cost recovery and from surplus fish and egg sales, but includes income tax. The reason for this distinction in the analysis is that cost recovery fees and surplus revenues constitute an explicit "payment" for goods and services provided by government, i.e. SEP. Cost recovery and surplus sales revenues are presented in section 7 below.

harvesting, is sufficient to handle additional volumes of fish. Therefore, while some increase in fishing days and processing labour will be required to harvest and process SEP fish, most of the direct downstream income generated is in the form of profits, not wage and salary income. Not shown in the table is that SEP will also produce additional economic value in the Native food fisheries equivalent to an annual wholesale value of about $17 million.(1).

TABLE 3.5

SEP Program Incremental Downstream Activity*

Annual Direct Impacts at Full Production

(Existing Cost Recovery)

Sector	Total Revenues/ Expenditures (millions 1987$)	Direct Income** (millions 1987$)	Direct Employment+ (PYs)
Harvesting	93.0	62.3	170
Processing	57.0	48.5	315
Rack Sales	0.9	0.6	10
Recreational	20.3	8.1	170
TOTAL	171.2	119.5	665

*Excludes value of Native food fishery. Recreational impacts represent upper bound estimate.
**Includes profits as well as wages and salaries. For example, for harvesting, the direct income impact consists of $4.5 million in wages and salaries (arising from an increase in fishing days) and $57.8 million in profits (arising from increased returns to the fishing fleet).
+Based on the wage and salary component of the income impact and on average wage and salary of $27,000/PY for harvesting and processing and $20,000/PY in recreation-related industries, as derived from current assumptions in SEP Model.

(1) Source: SEP Evaluation Model.

(b) Indirect Impacts:- The indirect impacts of SEP-related downstream activities in B.C. and Canada were estimated by means of input-output models in a manner similar to that for SEP expenditures as described in section 3.2.1 (b). The estimated indirect income and employment impacts generated annually in B.C. and Canada by SEP-related harvesting and processing at full production (with existing cost recovery) are summarized in Table 3.6. As shown in the table, these activities will generate indirectly in B.C. $49 million in income and about 1,300 PYs of employment per year. In Canada, SEP-related harvesting and processing will result in annual indirect income of $82 million and employment of 1,700 PYs.

TABLE 3.6

SEP Program Incremental Downstream Activity

Annual Indirect Impacts at Full Production

British Columbia and Canada

(Existing Cost Recovery)

Sector	Indirect Income (millions 1987$)		Indirect Employment (PYs)	
	B.C.	Canada	B.C.	Canada
Harvesting	36.0	57.9	920	1,215
Processing	10.0	15.0	220	315
Rack Sales	0.2	0.3	5	5
Recreational	2.8	8.9	150	185
TOTAL	49.0	82.1	1,295	1,720

(c) Total Direct and Indirect Impacts:- The sum of annual direct and indirect impacts of SEP-related downstream activities at full production are summarized below for B.C. and Canada in Tables 3.7 and 3.8, for the existing cost recovery scenario. As shown in Table 3.7, with no additional cost recovery the annual direct and indirect impact of SEP-related harvesting and processing in B.C. totals almost $170 million and 2,000 PYs, respectively. Table 3.8 shows that in Canada, downstream activities in the existing cost recovery scenario generate direct and indirect impacts of $200 million in income and 2,400 PYs in employment per year.

TABLE 3.7

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

British Columbia

(Existing Cost Recovery)

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	93.0	62.3	36.0	98.3	170	920	1,090
Processing	57.0	48.5	10.0	58.5	315	220	535
Rack Sales	0.9	0.6	0.2	0.8	10	5	15
Recreational	20.3	8.1	2.8	10.9	170	150	320
TOTAL	171.2	119.5	49.0	168.5	665	1,295	1,960

TABLE 3.8

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

Canada

(Existing Cost Recovery)

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	93.0	62.3	57.9	120.2	170	1,215	1,385
Processing	57.0	48.5	15.0	63.5	315	315	630
Rack Sales	0.9	0.6	0.3	0.9	10	5	15
Recreational	20.3	8.1	8.9	17.0	170	185	355
TOTAL	171.2	119.5	82.1	201.6	665	1,720	2,385

3.2.3 Impacts of Incremental Downstream Activity: Full Cost Recovery

(a) Direct Impacts:- The estimates of direct downstream impacts presented above are based on the assumption that no additional cost recovery measures are implemented. This would mean that only the estimated $6.9 million per year derived from current license fees and charges would be collected. However, with full cost recovery,(1) an additional $21.6 million would have to be collected. Based roughly on the sharing of SEP benefits by each fishery sector, some $19.6 would have to be collected from the commercial sector and $2.0 million would have to be collected from the recreational sector.

The $19.6 million collected from the commercial sector would not likely affect the direct employment impact in the harvesting or processing sector, because it would not likely affect the amount of harvesting or processing nor the labour intensity (employment per unit of output) in either sector. However, it would reduce the profit component of direct income impacts because of the greater fees and charges paid to government. Implicit in this analysis is the assumption that SEP generates rents or profits in the harvesting and processing sectors such that cost recovery fees can be absorbed without forcing

---

(1) The full cost recovery target was estimated by the Program Planning and Economics Branch as the total SEP budget less expenses which would have occurred without SEP, expenses which relate directly to social objectives and expenses intended to meet other government initiatives.

participants out of business. If this assumption were correct the partial recovery of investments taxpayers have made in the fishery could result in a more rationalized industry, by reducing the incentives to over-invest, with no less output.(1)

It is likely that cost recovery charges would be levied on the harvesting sector, but the extent to which that sector would bear all of those charges would depend on whether landed prices would rise. In other words, it would depend on whether the incidence of the cost recovery could be passed on to the processors. In this analysis it is assumed that the fishermen could pass on 50% of the cost recovery charges onto the processors.(2) The reduction in the harvesting sector direct income impact would therefore be $9.8 million per year.

The extent to which the processors would bear the other 50% of the cost recovery taxation would depend on their ability to pass on some of the charges to their wholesale customers. It is assumed in this analysis that they are not able to pass on any of the burden of the cost recovery charges to their customers and thus the processing sector's direct income impact would decline by the full $9.8 million

---

(1) See footnote 1, page 40.

(2) The incidence of cost recovery fees will depend on the elasticity of the supply and demand for salmon in landed markets. Econometric analyses of supply and demand elasticities have suggested that fishermen may bear somewhat more than 50% of cost recovery charges. See Devoretz, D. and Schwindt, R. "Harvesting Fish and Rents: A Partial Review of the Report of the Commission on Pacific Fisheries Policy", 1983. The 50% assumption is retained for purposes of this analysis because of the lack of conclusive evidence.

per year. It is possible that the processors might raise their prices in response to their burden of the cost recovery taxation. However, higher wholesales prices would depress sales, and total revenues would not increase unless the demand for salmon products were inelastic (relatively insensitive to price). Because it is unlikely that demand would be inelastic in the principal markets (mostly export) where the salmon would be sold, it is assumed that greater wholesale revenues could not be achieved.(1)

The $2 million in cost recovery fees collected from the recreational sector in effect raises the price or cost of recreational fishing. If there is any effect of price on demand, the higher fees would reduce somewhat the number of angler days generated by SEP and consequently reduce the expenditures, income and employment that would be generated. However, since the recreational cost recovery fees are small relative to total recreational expenditures, it is assumed that recreationists' response and therefore the reduction in impacts due to these fees would be insignificant in size.

In Table 3.9, the direct income and employment impacts with full cost recovery are summarized, based on the discussion above. As shown in the table the annual direct income generated by SEP with cost recovery is reduced to about $102 million as a result of additional

---

(1) The assumption that cost recovery charges could not be passed on to any significant degree to export customers is borne out (with the exception of chum) by econometric analyses of market demand elasticities. See Devoretz, D. and Schwindt, R., "A Critique of Pearse's Royalty Recommendations", 1982.

fees and license charges levied on the commercial sector.(1) Direct employment impacts remain at about 670 PYs per year.

TABLE 3.9

Incremental Downstream Activity*

Annual Direct Impacts at Full Production

(Full Cost Recovery)

Sector	Total Revenues/ Expenditures (millions 1987$)	Direct Income (millions 1987$)	Direct Employment** (PYs)
Harvesting	93.0	54.9	170
Processing	57.0	38.7	315
Rack Sales	0.9	0.6	10
Recreational	20.3	8.1	170
TOTAL	171.2	102.3	665

*Excludes value of Native food fishery. Recreational impacts represent upper bound estimate.

**Based on average income of $27,000/PY for harvesting and processing and $20,000/PY in recreation-related industries.

(1) Note that the reduction in direct harvesting sector income in the full cost recovery scenario is less than the increase in cost recovery charges. This is due to the nature of the reinvestment function which assumes that if profits in the harvesting sector are reduced, fishermen also reinvest less.

(b) Indirect Impacts:- With full cost recovery, the federal government's share of SEP-related downstream incomes would increase. This will reduce the indirect impacts of SEP-related downstream activities since the input-output models for B.C. and Canada do not estimate any indirect effects which may result from increased government revenues. Thus, the incomes of commercial fishermen and expenditures of recreationists and their respending effects are lower than in the existing cost recovery scenario. On the other hand, because the I-O models also do not estimate the indirect effects of corporate profits, there is no reduction in indirect impacts for the processing sector, only a redistribution of surplus to government.

The estimated indirect impacts of SEP-related harvesting and processing in B.C. and Canada, assuming full cost recovery, are summarized in Table 3.10 below. As shown in the table, annual indirect income and employment in B.C. is reduced to about $44 million and 1,200 PYs, respectively, in this scenario. In Canada, indirect income is reduced to $75 million and indirect employment to 1,600 PYs.

TABLE 3.10

SEP Program Incremental Downstream Activity

Annual Indirect Impacts at Full Production

British Columbia and Canada

(Full Cost Recovery)

Sector	Indirect Income (millions 1987$)		Indirect Employment (PYs)	
	B.C.	Canada	B.C.	Canada
Harvesting	32.6	52.5	830	1,100
Processing	10.0	15.0	220	315
Rack Sales	0.2	0.3	5	5
Recreational	1.6	7.1	115	150
TOTAL	44.4	74.9	1,170	1,570

(c) Total Direct and Indirect Impacts:- The sum of annual direct and indirect impacts of SEP-related downstream activities for the full cost recovery scenario are summarized in Tables 3.11 and 3.12. As shown in these tables, full cost recovery reduces the total annual direct and indirect impact of downstream activities to $146 million in income and 1,800 PYs in B.C. In Canada, the income impact is reduced to $176 million per year and employment to 2,200 PYs per year, respectively.

These results show that additional cost recovery measures do not greatly reduce the total income and employment impacts of SEP-related downstream activities. This stems partly from the assumption that harvesting effort and processing output will not be significantly affected by additional fees or charges. This is not an unreasonable assumption, particularly when such charges are viewed in the context of total, not just SEP-related downstream revenues and income. Another reason why the reduction in economic impacts due to cost recovery is not as great as might be expected is that redistributing processing profits to government revenues has no effect on respending impacts, since the I-O models do not estimate indirect effects for either corporate profits or government revenues. It should be noted that cost recovery would have a somewhat greater economic impact if the incidence of such fees on harvesting incomes (which are respent as household income) is greater than assumed in this study.

TABLE 3.11

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

British Columbia

(Full Cost Recovery)

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	93.0	54.9	32.1	87.0	170	820	980
Processing	57.0	38.7	10.0	48.7	315	220	535
Rack Sales	0.9	0.6	0.2	0.8	10	5	15
Recreational	20.3	8.1	1.6	9.7	170	115	285
TOTAL	171.2	102.3	43.9	146.2	665	1,160	1,825

TABLE 3.12

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

Canada

(Full Cost Recovery)

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	93.0	54.9	51.6	106.5	170	1,080	1,250
Processing	57.0	38.7	15.0	53.7	315	315	630
Rack Sales	0.9	0.6	0.3	0.9	10	5	15
Recreational	20.3	8.1	7.1	15.2	170	150	320
TOTAL	171.2	102.3	74.0	176.3	665	1,550	2,215

3.3 Increased Provincial Funding

3.3.1 Impacts of Provincial Expenditures

(a) Direct Impacts:- Similar to the approach taken for the SEP program, the direct income impact of total provincial expenditures over the 1988-1992 period is estimated by multiplying the income content for each type of project or activity (as indicated in Appendix A) by the corresponding total expenditures in each category. Employment impacts are then estimated by means of an assumption regarding average income per person year. The results are summarized in Table 3.13. Over the 1988-92 period, increased provincial spending of $15 million would generate an estimated $6.1 million in direct wage and salary income and about 190 PYs in direct employment.

TABLE 3.13

Increased Provincial Expenditures

Cumulative Direct Impacts (1988-1992)

	Total Expenditures (millions 1987$)	Direct Income (millions 1987$)	Direct Employment (PYs)*
Construction	8.3	2.9	85
Operation	5.0	2.3	75
Planning, Administration & Other Support	1.9	0.9	30
TOTAL	15.2	6.1	190

*Based on average annual income/PY of $35,000 for construction and $30,000 for program operations and support activities.

(b) Indirect Impacts:- The estimated indirect impacts of increased provincial expenditures in B.C. and Canada by category of enhancement activity are presented in Table 3.14. As shown in the table, provincial program expenditures will generate indirectly in B.C. a total of almost $10 million in income and about 245 PYs of employment over the 1988-1992 period. In Canada, the indirect impact of provincial expenditures over the 5 year period will total about $15 million and 315 PYs of employment.

TABLE 3.14

Provincial Program Expenditures

Cumulative Indirect Impacts (1988-1992)

Type of Expenditures	Indirect Income (millions 1987$)		Indirect Employment (PYs)	
	B.C.	Canada	B.C.	Canada
Construction and Major Maintenance	5.5	8.4	135	175
Operation	2.9	4.7	75	100
Planning, Administration & Other Support	1.1	1.8	35	40
TOTAL	9.5	14.9	245	315

(c) Total Direct and Indirect Impacts:- The sum of direct and indirect impacts of provincial program expenditures over the 1988-1992 period in B.C. by type of enhancement expenditure are summarized in Table 3.15. Over this period, the direct and indirect income and employment impact of provincial expenditures in B.C. totals about $16 million and 435 PYs, respectively. The results for Canada, presented in Table 3.16, show that provincial expenditures generate direct and indirect impacts of $21 million in income and 505 PYs in employment over the 1988-92 period.

3.3.2 Impacts of Incremental Downstream Activity

(a) Direct Impacts:- The direct income impacts of increased provincial enhancement spending is estimated as the product of per dollar impact estimates (shown in Appendix B) and the corresponding revenues and expenditures associated with full production downstream harvesting and processing. Estimates are developed on the assumption of no cost recovery. The total wholesale value of the 600,000 pieces of salmon generated annually by increased provincial enhancement funding is estimated at approximately $13.7 million per year. Of this, it is estimated that $7.1 million, or about 52% will accrue to the harvesting sector and $6.6 million or 48% to processors.(1)

---

(1) Source: SEP Evaluation Model.

TABLE 3.15

Provincial Program Expenditures

Total Direct and Indirect Impacts (1988-1992)

British Columbia

Type of Expenditure	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Construction and Major Maintenance	8.3	2.9	5.5	8.4	85	135	220
Operation	5.0	2.3	2.9	5.2	75	75	150
Planning, Administration & Other Support	1.9	0.9	1.1	2.0	30	35	65
TOTAL	15.2	6.1	9.5	15.6	190	245	435

TABLE 3.16

Provincial Program Expenditures

Total Direct and Indirect Impacts (1987-1991)

Canada

Type of Expenditure	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Construction and Major Maintenance	8.3	2.9	8.4	11.3	85	175	260
Operation	5.0	2.3	4.7	7.0	75	100	175
Planning, Administration & Other Support	1.9	0.9	1.8	2.7	30	40	70
TOTAL	15.2	6.1	14.9	21.0	190	315	505

With respect to the recreational sector, it is estimated that the proposed additional provincial projects will result in an additional 9,200 pieces of salmon per year in the sport fishery (see Table 2.6 in section 2) This represents an increase of about 1% over what sport fishermen would catch without additional provincial funding. Assuming an effort response elasticity with respect to catch of up to .50 (i.e. the 1% increase in catch will result in up to a 0.5% increase in recreational angler days) would mean an increase in fishing days of up to 9,000 per year. At $70 per day, the expenditure impact would be up to 630,000 per year.

In Table 3.17, incremental downstream revenue and expenditure impacts and the associated direct income and employment are summarized. As shown in the table, the incremental downstream activity due to increased provincial funding will annually generate up to $9.8 million in direct income and up to 55 PYs in employment when provincial facilities are operating at full target production. These facilities will also produce an annual wholesale value equivalent in Native food fisheries of about $.9 million per year.(1)

---

(1) Rack sales associated with new provincial enhancement facilities are assumed to be negligible.

TABLE 3.17

Provincial Projects Incremental Downstream Activity

Annual Direct Impacts at Full Production

Sector	Total Revenues/ Expenditures (millions 1987$)	Direct Income (millions 1987$)	Direct Employment* (PYs)
Harvesting	7.1	5.0	15
Processing	6.6	4.6	35
Recreational	0.6	0.2	5
TOTAL	14.3	9.8	55

*Based on same average income/PY assumptions as in section 3.2.2.

(b) Indirect Impacts:- The indirect impacts of SEP-related downstream activities in B.C. and Canada were estimated by means of input-output models in a manner similar to that for SEP expenditures as described in section 3.2.1 (b). The estimated indirect income and employment impacts generated annually in B.C. and Canada by provincial program-related harvesting and processing at full production are summarized in Table 3.18. As shown in the table, these activities will generate indirectly in B.C. an additional $4 million in income and 100 PYs of employment per year. In Canada, provincial program-related harvesting and processing will result in annual indirect income of $7 million and employment of 135 PYs.

TABLE 3.18

Provincial Program Incremental Downstream Activity

Annual Indirect Impacts at Full Production

British Columbia and Canada

Sector	Indirect Income (millions 1987$)		Indirect Employment (PYs)	
	B.C.	Canada	B.C.	Canada
Harvesting	2.8	4.6	70	95
Processing	1.2	1.7	25	35
Recreational	.2	.4	5	5
TOTAL	4.2	6.7	100	135

(c) Total Direct and Indirect Impacts:- The sum of annual direct and indirect impacts of provincial program-related downstream activities at full production for B.C. and Canada are shown in Tables 3.19 and 3.20. As shown in Table 3.19, the annual direct and indirect impact of provincial program-related harvesting and processing in B.C. totals $14 million and 155 PYs, respectively. In Canada, provincial program-related downstream activities will generate direct and indirect impacts of $17 million in income and 190 PYs in employment per year.

TABLE 3.19

Provincial Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

British Columbia

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	7.1	5.0	2.8	7.8	15	70	85
Processing	6.6	4.6	1.2	5.8	35	25	60
Recreational	0.5	0.2	0.2	0.4	5	5	10
TOTAL	14.2	9.8	4.2	14.0	55	100	155

TABLE 3.20

Provincial Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

Canada

Sector	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Harvesting	7.1	5.0	4.6	9.6	15	95	110
Processing	6.6	4.6	1.7	6.3	35	35	70
Recreational	0.5	0.2	0.4	0.6	5	5	10
TOTAL	14.2	9.8	6.7	16.5	55	130	190

4.0 SUB-REGIONAL IMPACTS

The income and employment impacts of SEP and proposed additional provincial enhancement funding are estimated below for the following selected sub-regions in B.C.:

- Skeena-Queen Charlottes
- Mt. Waddington - Central Coast
- Alberni-Clayoquot

These regions are considered to be representative of the lesser developed coastal areas in B.C. for which SEP is intended to provide an economic stimulus. They are each identified separately in the SEP Model as three of the ten regions into which enhancement and downstream harvesting and processing expenditure data are disaggregated.

The direct and indirect economic impacts of federal and provincial enhancement program expenditures are estimated for each of the above sub-regions over the 5 year study periods for these programs. Full production downstream harvesting and processing impacts are estimated for each region on an annual basis. Impacts are first estimated for federal SEP and then for new, proposed B.C. projects.

4.1 Sub-Regional Impacts of SEP

4.1.1 SEP Program Expenditures by Sub-Region

SEP expenditures over the 1987-1991 period by sub-region in B.C. are shown in Table 4.1. As shown in the table, SEP expenditures in the 3 regions selected for sub-regional analysis total $44 million over the 5 year period, accounting for about 21% of total SEP expenditures in the period. Note that over 80% of SEP expenditures on fish production facilities (excluding support activities) are made in non-lower mainland areas of B.C.

4.1.2 Economic Impacts of SEP Program by Selected Sub-Region

(a) Direct Impacts:- The direct income impact of total SEP program expenditures by region is estimated by multiplying the construction and operation expenditures in each region by the weighted average income content of these expenditures. Weighting factors are derived from the actual mix of SEP projects undertaken in each region. Employment impacts are then estimated by means of an assumption regarding average income per person year.(1) The results are summarized in Table 4.2.

---

(1) Based on average annual income/PY of $35,000 for construction and $30,000 for program operations activities taking into account the appropriate mix of activities in each region. It is assumed that all direct income and employment associated with SEP expenditures accrue to residents of the region in which the expenditures are made.

TABLE 4.1

SEP Program Expenditures (1987-1991)

by Region*

(millions 1987$)

Region	Support	Construction	Operating	Total	%
Lower Mainland	57.5	6.3	20.8	84.6	40.6
Capital	-	.1	.9	1.0	.4
Cowichan-Nanaimo	4.1	.2	3.3	7.6	3.7
Alberni-Clayoquot**	-	2.4	14.2	16.6	8.0
Comox-Strathcona	-	3.7	19.9	23.6	11.3
Sunshine Coast	-	.7	4.4	5.1	2.4
Waddington-Central Coast**	-	7.2	11.7	18.9	9.1
Skeena-Queen Charlotte Is.**	-	1.8	6.7	8.5	4.1
Kitimat-Stikine	-	.9	12.8	13.7	6.6
Interior B.C.	-	7.1	21.2	28.3	13.6
TOTAL	61.7	30.6	116.0	208.2	100.0

*Figures may not add due to rounding.

**Regions selected for detailed analysis.

(b) Indirect Impacts:- The indirect impacts of SEP expenditures within each of the sub-regions are estimated by means of regional income multipliers. These multipliers indicate the total increase in income in a region generated by the respending of a $1 increase in direct household income, based on estimates of the proportion of income retained locally after each round of respending. Employment multipliers are derived from income multipliers by means of an assumption regarding average income per person year.(1)

The income and employment multipliers for each of the selected sub-regions are assumed to be $1.15 per dollar of income and 44 PYs per million dollars of income,(2) based on estimates developed by H.C. Davis in a recent study for the Provincial Parks and Outdoor Recreation Branch.(3) A constant multiplier was used since Davis' results indicate that the scale of the multiplier does not vary greatly by region if the size of the economies do not differ significantly. This is the case for the three sub-regions selected for analysis.(4)

---

(1) Household income is defined here as wages and salaries plus net income of small business owners such as fishermen.

(2) That is, for a million dollars of direct household income injected into a region, the total direct and indirect income and employment impact will be $1.15 million and 44 PYs, respectively.

(3) H.C. Davis, "B.C. Regional Economic Multipliers," B.C. Ministry of Lands, Parks & Housing, 1985. See also an article by the same author entitled "Income and Employment Multipliers for Seven British Columbia Regions," Canadian Journal of Regional Science, IX:1, 1986.

(4) Total employment in the 3 regions ranged from about 7,000 to 14,000 in 1981, the latest year for which data was readily available. Source: Statistics Canada, 1981 Census data.

The multipliers used below therefore represent approximations rather than calculated estimates for each region. They trace the respending in the sub-region arising from an initial injection of SEP-related wage and salary income but not the inter-industry respending resulting from other SEP expenditures on goods and services. Therefore, the multipliers do not completely take into account inter-industry effects. However, such effects are relatively minor in the small sub-regions selected for analysis. The indirect impacts of SEP expenditures in each of the selected sub-regions are shown in Table 4.2. The multiplier methodology is discussed in more detail in Appendix C.

(b) Total Direct and Indirect Impacts:- The total direct and indirect impacts of SEP expenditures over the 1987-1991 period are summarized in Table 4.2 for each of the selected sub-regions. The $44 million of SEP spending in these sub-regions generates total income and employment of $22.3 million and 850 PYs, respectively.

4.1.3 Economic Impacts of SEP-Related Downstream Activity by Sub-Region

The distribution of annual SEP-related downstream expenditures and revenues at full production by sub-region in B.C. is shown in Table 4.3. SEP-related commercial harvesting and processing revenues by sub-region are estimated by the SEP Model.(1)

---

(1) The SEP Model assigns harvesting revenues to sub-regions on the basis of residence of fishermen, processing revenues on the basis of landing points and processing profits on the basis of head office location.

TABLE 4.2

SEP Program Expenditures

Total Direct and Indirect Impacts (1987-1991)

by Selected Sub-Region

Sub-Region	Expenditures	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Skeena-Queen Charlottes	8.5	4.1	0.6	4.7	133	47	180
Mt. Waddington-Central Coast	18.9	8.1	1.2	9.3	257	99	356
Alberni-Clayoquot	16.6	7.2	1.1	8.3	237	80	317
TOTAL	44.0	19.4	2.9	22.3	627	226	853

TABLE 4.3

SEP Program Incremental Downstream Activity

Annual Expenditures and Revenues at Full Production

By Region*

(millions 1987$)

Region	Commer. Wholesale Value	Sport Fishing Expenditures	Rack Wholesale Value	TOTAL	%
Lower Mainland	100.6	12.6	0.4	113.6	66.5
Capital	4.9	1.7	--	6.6	3.9
Cowichan-Nanaimo	6.4	1.8	--	8.2	4.8
Alberni-Clayoquot	1.9	1.0	0.3	3.2	1.9
Comox-Strathcona	6.8	1.0	0.3	8.1	4.7
Sunshine Coast	2.4	0.8	--	3.2	1.9
Waddington-Central Coast	6.4	0.6	--	7.0	4.1
Skeena-Queen Charlotte Is.	18.3	0.4	--	18.7	10.9
Kitimat-Stikine	0.9	0.4	--	1.3	0.8
Interior B.C.	1.0	--	--	1.0	0.5
TOTAL	150.0	20.3	0.9	171.2	100.0

*Excludes Native food fish values. Figures may not add due to rounding.

The regional distribution of sport fishing expenditures is based on the effort response estimates for this sector developed in section 3.2.2 and the percentage distribution of this effort estimated in the SEP Model. The regional distribution of rack sales was provided by the SEP Program Planning and Economics Branch. As shown in Table 4.3, about one-third of SEP-related downstream revenues and expenditures accrue to non-lower mainland regions.(1) The disparity between the regional distribution of SEP program and downstream activity is due to the fact that many fishermen and much of the processing capacity in B.C. are located in the lower mainland. The 3 sub-regions selected for analysis together account for about 17% of total SEP-related downstream revenue expenditures in B.C.

(a) Direct and Indirect Impacts (Existing Cost Recovery):- The annual direct income impacts by region of SEP-related harvesting and processing, without additional cost recovery, are estimated by multiplying the per dollar income content of these activities (see Appendix B) by the corresponding revenues and expenditures that the program generates in each region at full production. Direct employment is calculated by dividing the wage and salary content of downstream revenues and expenditures by average wages in each of the downstream sectors (see Table 3.5 above). The indirect impacts of SEP-related downstream activities within each of the three sub-regions are derived by applying the regional multipliers discussed in section 4.1.2

---

(1) Excludes distribution of Native food fish values.

(b) to the direct wage and salary content of downstream revenues and expenditures.(1) The total direct and indirect impacts of SEP-related downstream activities in each of the 3 sub-regions are summarized in Table 4.4. Total direct plus indirect income and employment in the three regions is estimated at $22.1 million and 110 PYs, respectively.

(b) Direct and Indirect Impacts (Full Cost Recovery):- The estimates presented in Table 4.4 are based on the assumption of no additional cost recovery. With full cost recovery, direct income impacts at the sub-regional level would be reduced somewhat as a result of increased federal government levies. Depending on the nature of such levies it is difficult to estimate their regional incidence. For purposes of simplicity it is assumed that the regional incidence of cost recovery measures is directly related to the regional distribution of SEP-related landed and wholesale commercial value and recreational expenditures.(2)

In Table 4.5, the direct and indirect impact of downstream harvesting and processing by sub-region assuming additional cost recovery, is summarized. As shown in the table, total direct and indirect income in all of the selected sub-regions is reduced to $17.6

---

(1) Note that direct employment estimates and multipliers in Table 4.4 appear to be low since most of the downstream income generated is in the form of profits not wages and salaries.

(2) This would not be an unreasonable assumption for commercial harvesting if government levies took the form of a landings royalty. One would also expect some correlation between the regional distribution of recreational catch and license and tagging fees.

TABLE 4.4

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

by Selected Sub-Region

(Existing Cost Recovery)

Sub-Region	Expenditures/ Revenues	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Skeena-Queen Charlottes	18.7	13.7	1.3	15.0	63	13	76
Mt. Waddington-Central Coast	7.0	4.6	0.6	5.2	18	4	22
Alberni-Clayoquot	3.2	1.7	0.2	1.9	9	3	12
TOTAL	28.9	20.0	2.1	22.1	90	20	110

TABLE 4.5

SEP Program Incremental Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

by Selected Sub-Region

(Full Cost Recovery)

Sub-Region	Expenditures/ Revenues	Income (millions 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Skeena-Queen Charlottes	18.7	11.8	1.2	13.0	63	13	76
Mt. Waddington-Central Coast	7.0	4.2	0.6	4.8	18	4	22
Alberni-Clayoquot	3.2	1.6	0.2	1.8	9	3	12
TOTAL	28.9	17.6	2.0	19.6	90	20	110

million per year as a result of additional government charges. Employment impacts in the sub-regions are shown to be unaffected by cost recovery, for two reasons. Firstly, as assumed in section 3.2.2, the level of activity, and therefore direct employment in, downstream harvesting and processing is not affected by cost recovery. Secondly, regarding indirect employment, the regional income multiplier measures only the impact of respending wages and salaries. Since only the wage and salary component of the harvesting sector would only be marginally affected by cost recovery charges,(1) indirect employment stemming from respending of household incomes would also be affected only negligibly.

4.2 Sub-Regional Impacts of Increased Provincial Funding

4.2.1 Provincial Expenditures by Sub-Region

Proposed provincial program expenditures over the 1988-1992 period are shown in Table 4.6 for each of the 3 selected sub-regions. As shown in the table, proposed provincial enhancement expenditures in the 3 selected sub-regions total $5.2 million, accounting for about one-third of total provincial expenditures.

---

(1) Profits in the harvesting sector are assumed to be equivalent to wages and salaries in terms of respending effects.

4.2.2 Economic Impacts of Provincial Expenditures by Sub-Region

The direct, indirect and total income and employment impacts of provincial enhancement expenditures by sub-region are shown in Table 4.7. Note that while no program expenditures are made in Alberni-Clayoquot, there are some downstream impacts generated in this region by the provincial program.

4.2.3 Economic Impacts of Provincial Enhancement-Related Downstream Activity by Sub-Region

The distribution of annual provincial enhancement-related downstream expenditures and revenues at full production by region in B.C. is shown in Table 4.8. As shown in the table, the 3 regions selected for analysis altogether account for only about 9% of total provincial-related downstream expenditures in B.C. Most of the downstream expenditures and resulting economic impacts of the provincial program are located in the lower mainland.

TABLE 4.6

Increased Provincial Expenditures (1988-1992)

by Region

(millions 1987$)

Region	Support	Construction	Operating	Total	%
Lower Mainland	1.8*	.3	.5	2.6	17.1
Capital	--	--	--	--	--
Cowichan-Nanaimo	--	1.6	1.3	2.9	19.1
Alberni-Clayoquot	--	--	--	--	--
Comox-Strathcona	--	.3	--	.3	2.0
Sunshine Coast	--	--	--	--	--
Waddington-Central Coast	--	3.5	1.1	4.6	30.3
Skeena-Queen Charlotte Is.	--	.5	.1	.6	3.9
Kitimat-Stikine	--	.2	--	.2	1.3
Interior B.C.	--	2.0	2.0	4.0	26.3
TOTAL	1.8	8.4	5.0	15.2	100.0

*For purposes of this analysis, the location of support activities for additional provincial projects was assumed to be Vancouver, although this would have to be determined prior to program implementation.

TABLE 4.7

Provincial Program Expenditures

Total Annual Direct and Indirect Impacts

by Selected Sub-Region

Sub-Region	Expenditures	Income (thousands 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Skeena-Queen Charlottes	600	225	35	260	7	3	10
Mt. Waddington-Central Coast	4,600	1,730	260	1,990	52	23	75
Alberni-Clayoquot	--	--	--	--	--	--	--
TOTAL	5,200	1,955	295	2,250	59	26	85

TABLE 4.8

Provincial Program-Related Downstream Activity

Annual Expenditures and Revenues

at Full Production

By Region

('000s 1987$)

Region	Commercial Wholesale Value	Sport Fishing Expenditures	TOTAL	%
Lower Mainland	10,790	410	11,200	78.5
Capital	430	60	490	3.4
Cowichan-Nanaimo	440	70	510	3.6
Alberni-Clayoquot	130	15	145	1.0
Comox-Strathcona	570	30	600	4.2
Sunshine Coast	90	30	120	0.8
Waddington-Central Coast	440	15	455	3.2
Skeena-Queen Charlotte Is.	680	5	685	4.8
Kitimat-Stikine	20	5	25	0.2
Interior B.C.	40	--	40	0.3
TOTAL	13,630	630	14,260	100.0

The direct, indirect and total downstream income and employment impacts of increased provincial enhancement spending in the 3 selected sub-regions are summarized in Table 4.9.

4.3 Importance of SEP and Increased Provincial Funding to Sub-Regional Economies

4.3.1 SEP

As shown in Tables 4.2 and 4.4 SEP-related downstream expenditures generate in the order of 100 person-years annually in each of the 3 sub-regions at full target production. Although this represents an average of less than 1% of total employment in these regions,(1) SEP-related activities still represent a significant source of livelihood in these areas where alternative employment opportunities are limited. Most of the jobs on enhancement projects are technical or skilled in nature and are very stable. With respect to downstream activities, SEP production has been designed to dampen cycles in the overall fishery and therefore increases the industry's contribution to the diversity and stability of the regional economy.

---

(1) Total annual SEP-related employment is estimated as one-fifth of employment generated by SEP program expenditures plus total annual downstream employment at full target production. Employment in the sub-regions is based on 1981 Census estimates adjusted upward by about 10% to reflect regional growth to the year of full SEP production.

TABLE 4.9

Provincial Program-Related Downstream Activity

Total Annual Direct and Indirect Impacts at Full Production

by Selected Sub-Region

Sub-Region	Expenditures	Income (thousands 1987$)			Employment (PYs)		
		Direct	Indirect	Total	Direct	Indirect	Total
Skeena-Queen Charlottes	685	535	10	545	3	--	3
Mt. Waddington-Central Coast	455	310	5	315	1	--	1
Alberni-Clayoquot	145	105	--	105	--	--	--
TOTAL	1,285	950	15	965	4	--	4

Constraining the contribution of SEP to regional economies is the fact that downstream expenditures and impacts tend to gravitate to the lower mainland. Many fishermen and much of the processing in B.C. are located in the lower mainland. Also, there are large inter-industry and consumer spending "leakage" effects from outlying regions to the lower mainland. Therefore, the sourcing of labour and other direct purchases for enhancement projects themselves is a very important determinant of the regional distribution of SEP income and employment benefits.

4.3.2 Increased Provincial Funding

The much smaller overall levels of proposed provincial funding and the even greater orientation of downstream impacts to the lower mainland means the impacts of the program on sub-regional economies will be small. The exception will be in areas where there is a concentration of expenditures on enhancement facilities. The regional distribution of program expenditures would be an important consideration for final resolution of the provincial program.

5.0 OTHER ECONOMIC IMPACTS OF ENHANCEMENT

The economic impact estimates developed in sections 3 and 4 above do not capture all of the economic effects of government enhancement programs. These estimates basically assume that the demand for goods and services generated directly and indirectly as a result of enhancement is met out of existing productive capacity in each industry of the economy, i.e. that no investments to expand capacity are required or would be stimulated by increased demand for their output. Only the impact of SEP-induced harvesting investment (e.g. on vessel and equipment upgrading) was considered.

It is possible that SEP production induces more investment in commercial processing, recreational equipment and in recreational service industries generally. SEP also supports investments in the aquaculture industry through enhancement research and egg production. All of these types of investments will generate additional income and employment in the provincial and national economies.(1)

Other types of enhancement-related economic effects may occur as a result of the provision of training benefits (through the CEDP program) and through the role of enhancement projects as a stimulus

---

(1) It should be noted that while investments in downstream commercial harvesting and processing do generate economic impacts, such investments are not necessarily beneficial from a fisheries management or efficiency perspective.

for broader-based community development. Examples of these types of impacts are discussed below. The discussion is more qualitative in nature because of uncertainties regarding the impact of SEP and data limitations regarding the activities themselves. SEP-induced processing investments and complementary investments which might occur on an economy-wide basis as a result of SEP's multiplier effects are not assessed because of lack of data.

5.1 Recreational Fisheries Investments Impacts

As estimated in section 3.2.2, SEP increases recreational effort by up to 16% over and above what would be expended without SEP. It could be argued that in addition to the increase in sport fishing effort and related expenditures, investments on sport fishing related capital goods (e.g. boats, property, etc.) by recreationists might also result. Total tidal angler capital expenditures were estimated at approximately $165 million in B.C. in 1985.(1) Only a very small portion of this could be deemed potentially attributable to SEP since major capital expenditures on assets which are partly used for non-fishing related recreation, are likely to be even more insensitive to catch than effort. However, even if only 1% of such expenditures were SEP-related, the expenditure impact on the B.C. economy would be about $1.7 million annually.

---

(1) Source: Sport Fishing Expenditure in B.C. Tidal Waters, Communications Directorate, DFO 1985.

Other impacts in the sport fishing sector which may be attributable to government enhancement programs are investments in recreation-related enterprises such as guide and charter operations, fisheries resorts and marinas. Such impacts are most clearly attributable to enhancement in areas where production facilities have resulted in new fisheries or have made a significant and identifiable contribution to increased catches in local fisheries. One such example is in the Alberni Inlet area where, as a result of the nearby Robertson Creek facility, local sport catch and effort has increased considerably in recent years. A number of investments have been made in Port Alberni which rely wholly or in significant part on recreational fishing activity. For example, a large resort ship and related charter vessels have begun a year round operation in the area. A number of marina and marine-oriented recreational vehicle facilities have been expanded or are in the planning stages. Based on contacts by SEP officials with local businessmen and community officials such investments would conservatively amount to several million dollars and support dozens of seasonal jobs on an on-going basis.

5.2 Aquaculture Investment Impacts

SEP provides support for the salmon farming industry in B.C. in two important respects. Firstly, the program provides the industry with about 75% of its broodstock requirements through the sale of eggs

surplus to hatchery requirements.(1) Although private sector supplies of eggs will grow in the future it is likely that in the short term the industry will continue to rely on surpluses from enhancement facilities, particularly for chinook.

Secondly, SEP also provides support to the industry directly or indirectly through research and experience developed in artificial rearing and training of program personnel who have eventually moved on to work in the aquaculture industry. For example, much of the recent research undertaken or partially funded by SEP, is important to the program as well as the aquaculture industry. Examples include the development of improved fertilization techniques, formulating diets and protein supplements to accelerate salmon growth rates and investigating disease and mortality problems in artificially raised fish.

The impact of SEP on the salmon farming industry has essentially been to accelerate its early development at a faster rate than would have otherwise occurred. Initially, the industry was solely dependent on egg supplies from government enhancement facilities. Currently, the value of production from the industry is roughly $1 million annually and employment is in the order of 150.(2) Capital investment in the industry and associated input supply businesses

---

(1) DPA Group Inc., "Industrial Organization of the B.C. Salmon Aquaculture Industry", for DFO, 1986.

(2) Ibid.

businesses totals in the many millions of dollars. Continued support from government enhancement programs through the supply of eggs, research and training will further contribute to growth and stability in the aquaculture industry.

5.3 Human Resource and Community Economic Development

A major element of the Community Development Program of SEP, aside from the construction and operation of fish production facilities, is the training of Native and other community groups in enhancement techniques and related skills such as administration. This is an investment which will yield future economic benefits for the community in terms of the greater employability and income earning potential of the individuals involved (e.g. in the aquaculture industry) and the potential for further investments in community-initiated enhancement projects. CEDP and other SEP projects themselves can also serve as a catalyst for further economic development in the community, for example, by stimulating investments in input supplier industries.

6.0 ECONOMIC SIGNIFICANCE OF EMPLOYMENT IMPACTS

6.1 Magnitude vs. Significance of Employment Impacts

The economic impacts estimated in the previous sections measure the magnitude of the income and employment generated by federal and possible provincial enhancement funding. However, the significance of these impacts, in terms of the net economic benefits they provide, depends on the extent to which the income and employment impacts accrue to persons who would otherwise be unemployed.

Net economic benefits refer to the value of what is produced less the costs of production. In the context of new employment, one can think of net economic benefits as the value of the employment, as measured by the wages, paid, minus the opportunity cost of the labour employed, i.e., the value of the alternative activity that is foregone as a result of the new employment. For persons who would otherwise be unemployed, the opportunity cost of the labour is low and consequently the net benefits of the new employment is relatively high. On the other hand, for persons who would otherwise be employed, the opportunity cost of the labour is high and the net benefits relatively low. Indeed, in the latter circumstances, the income and employment created by SEP would serve more to redistribute output and employment from one sector or industry to another, rather than increase it overall.(1)

---

(1) A net increase in economic output could still result from hiring a person who would otherwise be employed, by shifting that person to a more productive or valuable job. However, the increase in output would still be less than if an otherwise unemployed person were hired.

Thus, the greater the probability of hiring persons who would otherwise be unemployed, the more significant or beneficial will the economic impacts be. In this section, factors underlying the probability of hiring persons who would otherwise be unemployed are addressed and estimates of the corresponding employment benefits from SEP are presented.

6.2 Estimation Methods

Two basic methods have been used to estimate the probability of hiring persons who would otherwise be unemployed.

One approach relies on "labour response" functions which estimate these probabilities on the basis of the unemployment rates for the types and locations of jobs that are created. The basic assumption is that the greater the unemployment rate, the more will new jobs draw (directly or indirectly) from the pool of unemployed; the lower the unemployment rate, the more will new jobs simply pull up wage rates in the affected occupations and regions. The Haveman-Krutilla "labour response" equations are an example of this approach.(1) Their equations assume an "S"-type response curve where the probability of hiring a person who would otherwise be unemployed rises from zero to one as the unemployment rate rises from a "full

---

(1) See an application of this methodology in Shaffer, M. "The Employment Impacts of Salmonid Enhancement Proposals and the Social Cost of Labour", Appendix 12 of Economic Rationale for the Salmon Enhancement Program, for DFO, 1977.

employment" rate (typically assumed to be 5%) to a high unemployment rate at which it is assumed all those hired would otherwise be unemployed (typically 25%).(1)

An alternative approach is to estimate the probabilities on the basis of surveys of those actually hired. Questions related to their previous activities and other prospects would be used to estimate what proportion of those hired would likely have continued in or found alternative employment.

SEP planners have applied both of these methods in their program evaluations. Initial estimates of the probability of hiring persons who would otherwise be unemployed were developed on the basis of the Haveman-Krutilla methodology. These were then adjusted on the basis of a number of subsequent surveys of the actual labour force status of workers employed at individual enhancement projects.(2)

---

(1) A sine curve equation of the following form is used:

$$P = 0.5 \left[SIN\left(\pi \cdot \frac{U - U_f}{U_p - U_f} - \frac{\pi}{2}\right) + 1 \right]$$

Where: P = probability of hiring otherwise unemployed worker.
U_p = 25% = unemployment rate at which all those hired would be unemployed
U_f = 5% = unemployment rate at which no unemployed workers would be hired
U = 12% = actual unemployment rate

(2) See Strong Hall & Associates Ltd., "Shadow Pricing Construction Labour for Major Salmonid Enhancement Program Projects: A Methodological Assessment", for DFO, 1979. DPA Consulting Ltd. and Rank, A.D., "Evaluation of the Public Involvement Program", for DFO, 1983. DPA Consulting Ltd., "Analysis of the Economic Impacts of the SEP Community Development Program", for DFO, 1980.

There are a number of conceptual and measurement problems with both of the approaches discussed above. For example, regarding Haveman-Krutilla, while the unemployment rate undoubtedly influences the probability of hiring an unemployed worker, it is not clear at all that relationship is precise enough for predictive purposes. In fact, several empirical surveys which have been undertaken to test the Haveman-Krutilla hypothesis have indicated that it is generally a very poor predictive tool.(1) One reason for this is that the unemployment rate says nothing about the absolute level of unemployment, which can also have an important bearing on the chances of hiring a person who would otherwise be unemployed. The principle limitation of the survey method (which focusses on the employment status of the worker hired directly by a project) is that it ignores the "trickle down" process by which a new job could eventually result in the hiring of a person who would otherwise be unemployed through the creation of vacancies. The probability of a new job eventually resulting in the hiring of an unemployed worker could be much higher than suggested by the survey method.

---

(1) See Strong, Hall & Associates, Ltd., 1979, op. cit. Also see Epp, D.J., "Unemployment and Benefit-Cost Analysis: A Case Study Test of a Haveman-Krutilla Hypothesis", in Land Economics, Vol. 55, No. 3, August, 1979.

A more practical problem with both the Haveman-Krutilla and survey methods relates to the forecasting of labour market conditions. The assessment of whether individuals who would otherwise be unemployed will be hired as a result of a new project should take into account likely labour market conditions throughout the life of the project, not just when the individual is hired. This is particularly a problem for assessing on-going employment opportunities rather than temporary construction jobs. The survey method is particularly weak on this issue since surveys usually assume that the recent pre-project labour force status of a worker is representative of his or her likely status in the future without the project. The forecasting of unemployment rates by region and occupation presents a similar problem in the application of the Haveman-Krutilla methodology.

6.3 Distribution of Enhancement-Related Employment by Region and Occupation

Whatever estimation method is used, it is clear that the probability of hiring persons who would otherwise be unemployed depends on the types and locations of the jobs that are created. The regional and occupational distribution of the employment impacts generated as a result of enhancement are discussed below.

6.3.1 Regional Distribution of Employment Impacts

The regional distribution of direct employment in the construction and operation of SEP and proposed provincial enhancement facilities will be similar to the distribution of expenditures on enhancement projects themselves, as shown in Tables 4.1 and 4.6 above. These tables indicate that approximately 40% of SEP program expenditures are made in the lower mainland and 60% in other regions of B.C. The proposed provincial program analyzed here would be much more oriented to non-lower mainland regions; they would account for over 80% of expenditures.(1) Expenditure leakages from outlying regions will likely result in most of the B.C. indirect employment accruing to the lower mainland and to a lesser extent southern Vancouver Island.

The regional distribution of employment generated directly and indirectly as a result of enhancement-related downstream activities is even more oriented to the lower mainland area than for the enhancement programs themselves. As shown in Tables 4.3 and 4.8 for SEP and the proposed provincial program, respectively, the lower mainland would receive 65-80% of the direct revenues and expenditures

---

(1) The proportion of SEP's direct employment in non-lower mainland regions might be somewhat lower than these percentages to the extent that lower mainland workers are hired on SEP projects in these areas.

in downstream activities. An even greater proportion of the indirect impacts of downstream activities would accrue to the lower mainland because of high leakage effects in the outlying area.

6.3.2 Occupational/Skill Distribution of Employment Impacts

The occupational/skill breakdown of the direct employment impacts from the construction, operation and support of enhancement projects is shown in Table 6.1. The estimates are based on project employment breakdowns in the SEP model.

TABLE 6.1

Employment by Skill Category

SEP and Proposed Provincial Projects*

	Profes-sional	Techni-cal	Super-visory	Labour	Trades	TOTAL
SEP Program	34 (1)	1,057 (31)	716 (21)	1,057 (31)	546 (16)	3,410 (100.0)
Provincial Program	2 (1)	55 (29)	34 (18)	44 (23)	55 (29)	190 (100.0)

*Percentage breakdown in parentheses based on SEP Model.

Direct employment by sector in enhancement-related downstream activities is shown in Tables 3.5 and 3.17 for SEP and proposed provincial projects, respectively. Skill breakdowns are not available

for the commercial fishing and processing sectors, although most of the jobs would be semi-skilled in nature.

No detailed skill or occupational breakdown is available for the recreational sector or for the indirect impacts of enhancement program spending and related downstream expenditures. However, the input-output analysis does indicate, in very general terms, that employment in the recreational sector and employment generated indirectly by enhancement and downstream expenditures is created primarily in the service and to lesser extent, manufacturing sectors. Indirect employment created in the resource sectors is relatively minor.

6.4 Existing and Projected Labour Market Conditions in British Columbia

It is not just the types and locations of jobs that govern the probability of hiring persons who would otherwise be unemployed, but also the labour market conditions (e.g. unemployment rates) in the different regions and occupations.

Throughout 1987 and early 1988 there were an estimated 180,000 unemployed on average in British Columbia, representing about 12% of the labour force.(1) By way of comparison, total annual

---

(1) Source: Labour Force Survey, Statistics Canada, Catalogue 71-001. Labour force data does not include full time students or Indians on reserves.

employment generated directly and indirectly by SEP and the provincial program would comprise about 2% of total unemployment in B.C.(1) The breakdown of unemployment and unemployment rates by region, shown in Table 6.2, indicates that the lower mainland currently accounts for about 54% of the unemployed in B.C., while southern Vancouver Island and the rest of B.C. account for about 16% and 30%, respectively. These estimates reflect the distribution of population and labour force throughout B.C. Unemployment rates, however, are significantly higher in non-lower mainland regions.

The breakdown of current unemployment in B.C. by occupation and industry is shown in Tables 6.3 and 6.4 respectively. As Tables 6.3 and 6.4 show, unemployment rates are the highest in the other primary and construction industry and related occupations. Together these industries (which would correspond with enhancement facility construction and commercial harvesting) account for almost 20% of unemployment in B.C. Unemployment in manufacturing industries or processing occupations, within which would include fish processing, account for about 11% of total unemployment in B.C. Unemployment in the trade and service industries and related occupations, which would correspond to the majority of indirect enhancement-related employment, together account for almost one-half of the unemployment in B.C.

---

(1) Calculated as average annual direct and indirect employment in B.C. generated by federal and provincial program expenditures plus annual direct and indirect employment generated annually by enhancement-related downstream activities, at full target production.

TABLE 6.2

Unemployment and Unemployment Rates* by Sub-Region in B.C.

1975-1987

Sub-Region	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975
East Kootenay	-+ (--)+	4 (14.1)	4 (13.8)	4 (14.1)	4 (13.1)	-+ (10.3)	-+ (6.1)	-+ (6.8)	-+ (--)+	-+ (7.0)	-+ (7.9)	-+ (7.3)	-+ (7.0)
Central Kootenay	7 (14.7)	7 (17.0)	9 (20.2)	9 (19.1)	7 (16.6)	6 (15.0)	4 (10.8)	-+ (9.3)	-+ (8.2)	-+ (9.3)	-+ (8.3)	-+ (9.2)	4 (10.6)
Okanagan	16 (13.9)	18 (16.2)	17 (15.0)	16 (14.3)	16 (15.6)	13 (12.6)	8 (7.8)	7 (8.6)	7 (8.4)	8 (9.4)	7 (9.6)	5 (7.5)	6 (10.3)
Squamish-Nicola	8 (14.7)	9 (15.6)	9 (16.3)	10 (17.7)	10 (17.7)	10 (17.3)	6 (10.5)	4 (9.0)	5 (9.3)	5 (10.4)	5 (11.2)	5 (11.6)	4 (12.0)
Lower Mainland	96 (11.4)	91 (11.0)	105 (13.2)	107 (13.9)	97 (12.6)	79 (10.4)	39 (5.3)	41 (5.6)	49 (7.1)	52 (7.7)	52 (7.9)	54 (8.5)	49 (7.7)
Vanc. Is.-Cent. Coast	28 (11.4)	32 (13.9)	36 (14.9)	39 (16.1)	35 (14.9)	32 (13.8)	21 (9.0)	20 (8.9)	18 (8.4)	19 (8.9)	19 (9.6)	17 (8.7)	18 (9.4)
Cariboo	13 (13.3)	14 (14.4)	15 (15.7)	16 (16.5)	15 (15.9)	16 (18.2)	7 (7.7)	7 (7.6)	7 (8.5)	8 (9.9)	6 (8.6)	6 (8.3)	5 (9.4)
North	8 (12.4)	8 (12.7)	9 (14.9)	4 (9.9)	6 (15.6)	5 (11.7)	-+ (6.8)	-+ (4.8)	-+ (7.2)	-+ (6.9)	-+ (8.5)	-+ (7.2)	4 (10.2)
TOTAL	178 (12.0)	183 (12.6)	203 (14.2)	208 (14.7)	192 (13.8)	166 (12.1)	91 (6.7)	88 (6.8)	95 (7.6)	99 (8.3)	98 (8.5)	96 (8.6)	92 (8.5)

*Unemployment rate in parentheses.

+Estimates are not provided becuase of high error associated with small sampling size.

Source: Statistics Canada, 71-001

TABLE 6.3

Unemployment by Industry

British Columbia: 1987

Industry	Unemployed ('000)	Unemployment Rate	% of Total Unemployed
Agriculture	7	18.4	3.9
Other Primary	12	18.5	6.7
Manufacturing	19	10.8	10.7
Construction	20	21.7	11.2
Transportation, Communication & Other Utilities	8	6.3	4.5
Trade	27	9.9	15.2
Finance, Insurance and Real Estate	4	4.8	2.3
Services	55	10.6	30.9
Public Administration	9	9.4	5.1
Unclassified*	17	100.0	9.5
TOTAL	178	12.0	100.0

*Comprises unemployed persons who have never worked before and those persons who last worked more than 5 years ago.

Source: Statistics Canada, Catalogue 71-001.

TABLE 6.4

Unemployment by Occupation

British Columbia: 1987

Occupation	Unemployed ('000)	Unemployment Rate	% of Total Unemployed
Managerial, Professional	26	6.4	14.6
Clerical	22	9.8	12.4
Sales	15	9.6	8.4
Service	32	14.4	18.0
Primary Occupations	18	21.9	10.1
Processing	18	11.0	10.1
Construction	19	20.0	10.7
Transportation	5	7.6	2.8
Materials Handling and Other Crafts	6	11.3	3.4
Unclassified*	17	100.0	9.5
TOTAL	178	12.0	100.0

*Comprises unemployed persons who have never worked before and those persons who last worked more than 5 years ago.

Source: Statistics Canada, Catalogue 71-001.

The short and long term outlook for unemployment in B.C. is uncertain, particularly since external factors such as export markets, exchange rates and interest rates have such a large influence on the provincial economy. As shown in Table 6.2, high unemployment rates have persisted in B.C. over a very long period of time. Moreover, the table indicates that despite continuous economic growth in B.C. over the 1982-87 period, unemployment and unemployment rates have declined only slightly. Labour Force Survey(1) data also indicates that the average duration of unemployment has risen from 16 weeks in 1982 to almost 23 weeks in 1987.

No significant declines in unemployment are foreseen over the next several years. Indeed, it is possible that a cyclical downturn in economic growth may occur at some point over the next several years. Therefore, unemployment in B.C. is likely to remain at current high levels for the next 5 years. Unemployment rates in outlying regions and among particular groups such as Native people are also likely to remain significantly higher than the provincial average over this period.

In short, alternative employment prospects in British Columbia are not great nor are they likely to improve in the foreseeable future. This suggests that much of the employment created

---

(1) Source: Statistics Canada, Catalogue 71-001.

as a result of SEP could accrue to persons who would otherwise be unemployed. This is particularly true for employment created in outlying regions, lower skilled occupations and for Native people.

6.5 Specific Estimates

The SEP evaluation model contains specific estimates of the probabilities of hiring persons who would otherwise be unemployed based on the Haveman-Krutilla approach and surveys as discussed above. For Native people hired as a result of SEP, it is estimated that the probability that they would otherwise be unemployed is 100%.(1) This is because SEP surveys have shown very high unemployment rates in Native communities. For non-Native workers employed in SEP projects it is estimated that the probability of hiring persons who would otherwise be unemployed would range from 10% to 36% with the higher estimates applied to lower skilled labour jobs. With respect to downstream processing and harvesting, it is estimated that the probability of hiring persons who would otherwise be unemployed is 50%.

The SEP model does not provide estimates of the probabilities associated with indirect impacts of enhancement expenditures and related downstream activities. However, on the basis of average

---

(1) Native people account for about 5% - 10% of total direct jobs on SEP projects, but only a very negligible proportion of employment on provincial projects.

unemployment rates of 12%, the Haveman-Krutilla methodology would suggest a probability of approximately 27% of hiring a person who would otherwise be unemployed.

Based on these probabilities and on the estimates of employment in various categories generated as a result of SEP it is estimated that approximately 30% of the total direct and indirect employment generated as a result of SEP expenditures (approximately 1900 PYs over a 5 year period) would accrue to persons who would otherwise be unemployed. It is estimated that approximately 35% of the total direct and indirect employment generated from incremental downstream activities (about 650-700 PYs per year for the existing and full cost recovery scenario, respectively) would accrue to persons who would otherwise be unemployed.

For the proposed provincial program it is estimated that 25% of the program expenditure-related employment impacts or 105 PYs over a 5 year period, would accrue to persons who would otherwise be unemployed. For provincial downstream-related impacts 35% or 55 annual PYs would accrue to persons who would otherwise be unemployed.

It must be recognized these estimates are quite rough. Nonetheless, they do indicate that enhancement-related employment will provide significant employment benefits in British Columbia.

7.0 NET GOVERNMENT REVENUE IMPACTS

7.1 Sources of Government Revenue or Reduced Costs

To the extent that jobs and goods are produced which would not otherwise have been created, SEP and increased provincial enhancement expenditures will increase federal and provincial government revenues. Federal revenue sources include:

- cost recovery fees (existing and possible additional) levied directly on the commercial and recreational sectors;
- sales of eggs and fish which are surplus to hatchery requirements;
- sales and excise taxes on enhancement expenditures, related downstream expenditures and subsequent rounds of inter-industry and household spending;
- income tax generated directly and indirectly on enhancement expenditures, downstream expenditures and subsequent rounds of spending.(1)

B.C. government revenue sources will include sales and income taxes.(2)

In addition to generating tax and other revenues, federal and provincial enhancement programs may also displace or reduce other

---

(1) The personal and corporate income tax estimates in this section are included in, and therefore should not be added to, the income impact estimates in section 3.

(2) Any complementary investments which occur as a result of enhancement programs will also generate government tax revenues. However, these revenues are not estimated since the total magnitude of enhancement-related complementary investment is unknown.

government costs or expenditures. For example, social assistance or unemployment insurance payments are reduced to the extent that enhancement results in the hiring of otherwise unemployed workers. Provincial and federal personal income taxes are estimated below by source, first on a gross basis and then are adjusted downward on the basis of the probabilities of hiring otherwise unemployed workers as developed in section 6. These probabilities are also used to adjust corporate income tax and sales and excise tax revenues. The net government cost of SEP (under existing full cost recovery scenarios) and the proposed provincial program is also discussed below.

Cost recovery fees and revenue from sales of surplus eggs and fish are as estimated in section 3.2.2 above. Federal and provincial sales, excise and income tax revenues are estimated by means of the national and provincial models, respectively, and the following tax rates and assumptions developed by the B.C. Ministry of Economic Development for input-output analysis as follows:

Corporate Tax / Corporate Profit Ratio	.12
Federal / Provincial Split of Corporate Tax	.69/.31
Personal Tax / Personal Income Ratio	.28
Federal / Provincial Split of Personal Income Tax	.68/.32
Federal Indirect Tax / GDP at Factor Cost	.053
Provincial Indirect Tax / GDP at Factor Cost	.032

7.2 Government of Canada Revenues

7.2.1 SEP

(a) Program Expenditures:- Gross Federal sales and excise taxes generated directly and indirectly by SEP expenditures are estimated by the national I-O model at approximately $8.9 million over the 1987-1991 period. Gross federal revenues from taxes on personal and corporate income generated directly and indirectly by SEP expenditures are estimated at $47.3 million over the 1987-1991 period.

(b) Downstream Activities (Existing Cost Recovery):- As discussed in section 3.2.2, existing SEP cost recovery charges yield some $6.9 million/year in revenues to the federal government. Net government revenues from the sale of surplus hatchery fish will total about $180,000 per year at full target production. The sale of salmon eggs currently generates about $400,000 annually in federal revenues. These sales will eventually be discontinued and are therefore excluded from full target production SEP revenues.(1) Gross federal sales and excise taxes generated directly and indirectly by SEP-related downstream harvesting and processing (including rack fisheries),

---

(1) Projected egg sale revenues until 1996 are included in the calculation of net government financial impacts below. This differs from the approach taken in estimating full target production revenues since net financial impacts are calculated over the life of SEP, not just for one year.

assuming no additional cost recovery, total $4.8 million/year at full target production. Gross federal income tax revenues generated directly and indirectly by SEP-related downstream harvesting and processing are estimated at $29.3 million per year, without additional cost recovery.

(c) Downstream Activities (Full Cost Recovery):-- As estimated above, full cost recovery charges would amount to $28.5 million annually. Net government revenues from the sale of surplus fish would continue at $180,000 per year. With additional cost recovery, estimated federal sales and excise tax revenues are reduced somewhat to about $4.4 million/year, since a portion of what would have otherwise been respent by commercial and recreational fishermen goes to government revenues for which no respending is assumed. With additional cost recovery, total income taxes generated directly and indirectly by downstream activities are reduced to an estimated $26.0 million annually because of lower commercial harvesting and processing incomes and decreased respending effects.

(d) Federal Cost Savings:- It is conservatively estimated in section 6 that SEP expenditures will create about 1900 person-years of employment over the 1987-1991 period for persons who would otherwise be unemployed. SEP-related downstream activities will also create about 650-700 PYs per year for otherwise unemployed persons. This will result in savings for the federal government in terms of reduced

unemployment insurance and other social assistance payments.(1) The sharing of these cost savings between federal and provincial governments is very difficult to estimate since it requires a prediction of the type of assistance which would have been received by those who would have been otherwise unemployed. Some previous research on this issue has been conducted but only for CEDP projects which account for a relatively small proportion of SEP-related employment.(2)

For purposes of this study the proportion of otherwise unemployed receiving federal income assistance is estimated in two ways:(3)

- the ratio of the unemployment insurance recipients (about 200,000) to the total of "employable" provincial welfare recipients plus unemployment insurance case load (about 270,000);
- the proportion of unemployed for which the time elapsed since leaving their previous job was 12 months or less (on the assumption that those unemployed for greater than 12 months are likely to have exhausted their UI benefits).;

---

(1) Other federal assistance programs include social assistance for Native people and cost sharing on provincial welfare social assistance through the Canada Assistance Plan.

(2) DPA, 1980, op. cit.

(3) Data source for provincial welfare statistics is the B.C. Ministry of Social Services and Housing (Research, Evaluation and Statistics Branch); for unemployment insurance data, Canada Employment and Immigration Commission (Economic Services Branch); for unemployment data, Statistics Canada's Labour Force Survey; for federal social assistance payments to Natives on reserves, Department of Indian Affairs (Social Development Branch).

Both of these approaches, based on 1987 data, yield estimates that about 75% of those hired as a result of SEP and who would be otherwise unemployed, would have received federal unemployment insurance or Native social assistance payments.

Based on this estimated share, average benefits for various federal and provincial income assistance programs(2) and taking into consideration the fact that the federal government bears about half of provincial social assistance costs, yields federal cost savings of about $17.5 million associated with SEP expenditures over the 1987-1991 period and a further $6.4 million per year as a result of full production downstream activities. SEP-related cost savings would be over 3 times higher if all SEP-related jobs were considered new or incremental. The downstream estimate is based on the assumption of existing cost recovery. With full cost recovery, employment benefits and therefore incremental income assistance cost savings would be reduced only marginally.

(e) Total Government of Canada Tax Revenues and Cost Savings Generated by SEP:- Table 7.1 summarizes total direct and indirect tax revenues and cost savings accruing to Canada as a result

---

(1) Average benefits for federal UI, provincial welfare and Native social assistance recipients are estimated from the above sources at $11,000/year, $6,100/year and $5,700/year, respectively. These rates represent provincial average for clients in a wide range of familial and financial circumstances. Incremental federal cost savings resulting from SEP program expenditures are calculated on the basis that an estimated 10% of total direct and indirect employment benefits accrue to Native people.

of SEP, with existing and full cost recovery. Gross tax revenues and cost savings are shown first and then are presented on an incremental basis. Total federal incremental tax revenues and cost savings generated directly and indirectly by enhancement expenditures over the 1987-1991 period (excluding existing cost recovery and surplus sales revenues) are estimated at $34.4 million. Total incremental federal revenues and cost savings generated by downstream harvesting and processing are estimated at about $25.4 million/year with existing cost recovery and at $45.7 million annually assuming full cost recovery. Total federal tax revenues and cost savings would be much higher if all of the economic impacts generated by SEP were considered new or incremental. If this were the case, the gross estimates of federal revenues and cost savings in Table 7.1 would apply, i.e., $114 million generated by SEP expenditures over the 1987-1991 period and $59.5 million - $77.4 million for the existing and full cost recovery downstream scenarios, respectively. Note also that full cost recovery fees more than offset any decrease in indirect revenues as a result of reduced respending. As discussed in section 3.2.3, the increase in federal tax revenues would be somewhat smaller if cost recovery had a dampening effect on commercial and recreational harvesting effort and processing output, or if the incidence of cost recovery on the commercial sector were to fall more on fishermen.

TABLE 7.1

Summary of Revenues and Cost Savings to Canada
Associated with SEP Expenditures and
Related Downstream Activities

(millions 1987$)

Revenue/Saving Sources	Enhancement Expenditures Cumulative Revenues 1987-1991	Downstream Activities Annual Revenue Full Production Year	
		Existing Cost Recovery	Full Cost Recovery
Gross Revenues/Savings			
Direct Cost Recovery	--*	6.9	28.5
Surplus Sales**	--*	0.2	0.2
Sales and Excise Taxes	8.9	4.8	4.4
Corporate and Personal Income Taxes	47.3	29.3	26.0
Cost Savings	58.3	18.3	18.3
TOTAL	114.5	59.5	77.4
Net Revenues/Savings			
Revenues+	16.9	19.0	19.0
Cost Savings	17.5	6.4	6.4
TOTAL	34.4	25.4	45.7

*Existing cost recovery and surplus sales revenue would also be generated during the 1987-1991 period.
**Excludes current revenues from egg sales.
+Estimated as direct cost recovery and surplus sales plus 30% and 35% of program and downstream-related tax revenues, respectively.

7.2.2 Increased Provincial Funding

(a) Program Expenditures:- Gross federal sales and excise taxes generated directly and indirectly by provincial enhancement expenditures are estimated by the national I-O model at approximately $0.8 million over the 1988-1992 period. Federal revenues from taxes on personal and corporate income generated directly and indirectly by provincial enhancement expenditures are estimated at $3.3 million over the 1988-1992 period.

(b) Downstream Activities:- Gross federal sales and excise taxes generated directly and indirectly by related downstream harvesting and processing, total $0.4 million/year at full target production. Federal income tax revenues generated directly and indirectly by related downstream harvesting and processing are estimated at $2.5 million per year.

(c) Federal Cost Savings:- Based on the estimated provincial funding-related employment benefits estimated in section 6 and similar assumptions as in section 7.2.1 (d) regarding average recipient benefits and federal sharing of these costs, federal income assistance cost savings are estimated at about $1.1 million over the 1988-1992 period due to the provincial program itself and a further $0.6 million/year due to related downstream activity.

(d) Total Government of Canada Tax Revenues and Cost Savings Generated by Proposed Provincial Funding:- Table 7.2 summarizes total direct and indirect tax revenues (on a gross and incremental basis) and cost savings accruing to Canada as a result of the proposed

TABLE 7.2

Summary of Tax Revenues and Cost Savings to Canada Associated with Provincial Enhancement Expenditures and Related Downstream Activities

(millions 1987$)

Revenue/Savings Source	Enhancement Expenditures Cumulative Revenues 1988-1992	Downstream Activities Annual Revenue Full Production Year
Gross Revenues/Savings		
Sales and Excise Taxes	0.8	0.4
Corporate and Personal Income Taxes	3.3	2.5
Cost Savings	3.7	1.5
TOTAL	7.8	4.4
Net Revenues/Savings		
Revenues[+]	1.2	1.2
Cost Savings	1.1	0.6
TOTAL	2.3	1.8

*Estimated as direct cost recovery and surplus sales plus 30% and 40% of program and downstream revenues, respectively.
+Estimated as direct cost recovery and surplus sales plus 30% and 35% of program and downstream-related tax revenues, respectively.

provincial enhancement program. Total incremental federal tax revenues and cost savings generated by provincial enhancement expenditures themselves over the 1988-1992 period are estimated at $2.3 million. Total incremental tax revenues and cost savings generated directly and indirectly by related downstream activities are estimated at $1.8 million annually.

7.3 Government of British Columbia

7.3.1 SEP

(a) Program Expenditures:- Gross provincial sales taxes generated directly and indirectly by SEP expenditures are estimated by the provincial I-O model at approximately $3.5 million over the 1987-1991 period. Provincial revenues from taxes on personal and corporate income generated directly and indirectly by SEP expenditures are estimated at about $17 million over the 1987-1991 period.

(b) Downstream Activities (Existing Cost Recovery):- Gross provincial sales taxes generated directly and indirectly by SEP-related downstream harvesting and processing, assuming no additional cost recovery total $1.7 million/year at full target production. Provincial income tax revenues generated directly and indirectly by SEP-related downstream harvesting and processing are estimated at $11.7 million per year, without additional cost recovery.

(c) Downstream Activities (Full Cost Recovery):- With additional cost recovery, estimated gross provincial sales tax revenues generated by SEP are reduced slightly to about $1.5 million/year. With full cost recovery, total income taxes generated by downstream activities are reduced to an estimated $10.3 million annually.

(d) Provincial Cost Savings:- Assuming that 25% of SEP employment "beneficiaries" are receiving provincial income assistance and taking into account that the province incurs 50% of these costs, results in provincial cost savings of about $1.4 million during the 1987-1991 period due to SEP expenditures and a further $0.5 million/year due to related downstream activity.

(e) Total B.C. Government Tax Revenues Generated by SEP:- Table 7.3 summarizes total direct and indirect tax revenues accruing to the B.C. Government on a gross and incremental basis as a result of SEP, with and without cost recovery. Total incremental tax revenues and cost savings generated by SEP expenditures over the 1987-1991 period are estimated at $7.6 million. Incremental downstream-related provincial tax revenues and cost savings are estimated at $5.2 million/year, with existing cost recovery and $4.6 million annually, assuming full cost recovery.

TABLE 7.3

Summary of Tax Revenues and Cost Savings to B.C. Government Associated with SEP Expenditures and Related Downstream Activities

(millions 1987$)

Revenue/Savings Source	Enhancement Expenditures Cumulative Revenues 1987-1991	Downstream Activities Annual Revenue Full Production Year	
		Existing Cost Recovery	Full Cost Recovery
Gross Revenues/Savings			
Sales and Excise Taxes	3.5	1.7	1.5
Corporate and Personal Income Taxes	17.0	11.7	10.3
Cost Savings	4.7	1.4	1.4
TOTAL	25.2	14.8	13.2
Net Revenues/Savings			
Revenues	6.2	4.7	4.1
Cost Savings	1.4	0.5	0.5
TOTAL	7.6	5.2	4.6

7.3.2 Increased Provincial Funding

(a) Program Expenditures:- Gross provincial sales taxes generated directly and indirectly by provincial enhancement expenditures are estimated by the provincial I-O model at approximately

$0.3 million over the 1988-1992 period. Provincial revenues from taxes on personal and corporate income generated directly and indirectly by provincial enhancement expenditures are estimated at $1.2 million over the 1988-1992 period.

(b) Downstream Activities:- Gross provincial sales taxes generated directly and indirectly by related downstream harvesting and processing, total $0.1 million/year at full target production. Provincial income tax revenues generated directly and indirectly by related downstream harvesting and processing are estimated at $1.0 million per year.

(c) Provincial Cost Savings:- Based on assumptions similar to those in 7.3.1 (c), provincial cost savings associated with the provincial enhancement expenditures are estimated at about $0.1 million over the 1988-1992 period and less $50,000/year for related downstream expenditures.

(d) Total B.C. Government Revenues Generated by Proposed Provincial Funding:- Table 7.4 summarizes total direct and indirect tax revenues accruing to the B.C. Government as a result of the proposed provincial enhancement program. Total incremental tax revenues and cost savings accruing to the B.C. government as a result of provincial enhancement expenditures over the 1988-1992 period are estimated at $0.6 million. Total downstream-related tax revenues total $0.4 million annually.

TABLE 7.4

Summary of Tax Revenues to B.C. Government

Associated with Provincial Enhancement Expenditures and

Related Downstream Activities

(millions 1987$)

Revenue/Savings Source	Enhancement Expenditures Cumulative Revenues 1988-1992	Downstream Activities Annual Revenue Full Production Year
Gross Revenues/Savings		
Sales and Excise Taxes	0.3	0.1
Corporate and Personal Income Taxes	1.2	1.0
Cost Savings	0.3	0.1
TOTAL	1.8	1.2
Net Revenues/Savings		
Revenues	1.5	1.1
Cost Savings	0.1	---*
TOTAL	0.6	0.4

*Annual savings estimated at less than $50,000.

7.4 Net Financial Impacts of SEP and Increased Provincial Funding on Federal and B.C. Governments

7.4.1 Government of Canada

(a) SEP:- The net financial impact of SEP on the federal government was estimated for both the existing and full cost recovery scenarios as the present value of SEP costs minus cost recovery fees, surplus sales(1) and incremental federal tax revenues and cost savings, in constant 1987 dollars. Tax revenues and cost savings estimates associated with SEP expenditures themselves and with downstream activities are extrapolated over 25 years (1987-2011) on the basis of SEP cost and catch projections, respectively, as estimated by the SEP Model. In accordance with federal Treasury Board guidelines, a real rate of return of 10% is used to discount all values to a 1987 present value.

Based on this analysis the 1987 present value net cost of SEP to the federal government for the existing cost recovery scenario is estimated at about $100 million. At a 10% discount rate this is equivalent to a stream of costs of about $10 million per year. For the full cost recovery scenario, there is a present value net federal revenue of about $105 million, equivalent to $10.5 million per year discounted at 10%.

---

(1) Includes surplus egg sales but these are assumed to be phased out by 1996.

(b) Provincial Program:- The revenue and cost savings accruing to the federal government as a result of the proposed provincial program was estimated over the 1988-2012 period in a similar manner as for SEP. The present value of total federal tax revenues and cost savings resulting from increased B.C. funding is estimated at about $12 million, equivalent to $1.2 million annually.

7.4.2 Government of B.C.(1)

(a) SEP:- The present value of tax revenue and cost savings accruing to the provincial government as a result of the federal SEP program (i.e., net of the current provincial contribution to SEP) is estimated at $43 million or $4.3 million per year on an equivalent annualized basis under existing cost recovery. Under full cost recovery these estimates are reduced to $38 million or about $3.8 million per year on an annualized basis.

(b) Provincial Program:- The present value net cost to the B.C. government of the proposed provincial program is estimated at $16 million, equivalent to about $1.6 million per year.

---

(1) The estimate of net B.C. government financial impact does not include revenues generated by current provincial enhancement funding.

7.4.3 Summary of Net Financial Impacts

The above estimates of government financial impacts resulting from federal and provincial enhancement programs should be interpreted with caution for several reasons. First, with respect to SEP they do not take into account government costs and revenues prior to 1987. If SEP costs and revenues for this period were incorporated, the estimate of present value net cost to Canada would increase significantly because of the lag between up-front construction costs and fish production. The same qualification applies to the estimated impact of SEP on provincial finances although not to the same degree since provincial revenues and cost savings resulting from SEP expenditures alone would largely offset pre-1987 provincial costs.

The financial impact for SEP and the provincial program would also be significantly affected by assumptions about employment benefits, since they determine the estimates of incremental tax revenues and cost savings. To the extent actual employment benefits are higher than estimated in section 6, net government costs are over-estimated or conversely, net revenues underestimated. The choice of a lower discount rate would have the same effect (in direction, although not as significant), particularly for the provincial program, since enhancement costs are higher in earlier years while downstream tax revenues and cost savings occur over time.

Subject to the above qualifications, several points concerning the net financial impacts of the enhancement program emerge. First, about 75% of on-going (post-1987) program costs are offset by existing cost recovery revenues plus indirect tax revenue and cost savings. These revenues and cost savings actually exceed fish production costs which form the basis for the full cost recovery scenario analyzed in this report. Second, the implementation of full cost recovery measures would have a substantial positive effect on federal government finances since the increase indirect tax revenues from the fishing industry more than offset the decrease in indirect tax revenues and cost savings.(1)

Third, SEP generates a substantial net financial gain for the provincial government. On an annual basis, provincial revenues and cost savings resulting from SEP exceed current provincial enhancement expenditures by about $4 million per year. This would more than offset the annualized net cost of the proposed provincial enhancement program.

---

(1) This conclusion would not be significantly altered if different assumptions had been used regarding the incidence and effects of full cost recovery on commercial and recreational fishing industry activity.

Some final points should be made concerning the implications of the government financial analysis in this report for SEP cost recovery. While it would appear that direct and indirect federal revenues and tax savings under the existing cost recovery scenario already offset SEP costs deemed eligible for recovery, most of these revenues are derived from the economy at large rather than the direct beneficiaries of enhancement. Also, there are other broader issues, aside from recouping SEP costs, which will be important in formulating policies on cost recovery. For example, the role of such measures in providing taxpayers with some return for use of a public resource and in rationalizing an over-capitalized industry may be considered.

APPENDIX A

PER DOLLAR BREAKDOWNS OF EXPENDITURES ON ENHANCEMENT ACTIVITIES

1.0 Data Sources

Expenditure breakdowns for enhancement facilities and activities are based on breakdowns developed in a 1982 MSA study of the economic impacts of the proposed Phase II of SEP.(1) Although somewhat dated, the breakdowns are still considered by SEP staff to be sufficiently representative for the analysis of SEP and increased provincial funding.

Breakdowns for program planning and other support activities were derived from 1981-82 budget data provided by the Finance and Administration Unit of SEP. Construction costs for various types of fish production facilities were based on data for representative projects provided by the Engineering and Special Project Divisions of SEP as well as previous studies.(2) Operating cost breakdowns were generally based on detailed 1981-82 budget data for SEP administered projects.

---

(1) Marvin Shaffer & Associates Ltd., "The Economic Impact of SEP", November 1982.

(2) For example, see Strong, Hall & Associates, "An Assessment of Technological and Contracting Alternatives in SEP Major Projects", for DFO, April 1979.

The specific projects and data sources used for developing cost breakdowns for various types of fish production techniques are summarized in Table A.1 below. Note that lake enrichment has no construction phase per se. It is also assumed that operating costs for fishways are negligible. For hatcheries and spawning channels, cost breakdowns for larger projects are used since they will comprise the largest share, by far, of expenditures on these types of facilities. It is therefore assumed that construction and operating cost structures for fish production facilities do not vary by scale.

TABLE A.1

Facility Cost Sourcing

	Construction	Operation
Hatcheries (Large)	Chehalis	Puntledge
Spawning/Side Channels (Large)	Little Qualicum	Pinkut*, Fulton*
Fishway	Embley	--
Lake/Stream Enrichment	--	Finance & Administration Unit**
Other (Stream Improvements/ Transplant)+	Embley	Pinkut, Fulton

*Based on 1982/83 estimates for these facilities.

**Data for 1981/82 lake enrichment program.

+Based on discussions with SEP officials "Other" projects were assumed to have construction and operating cost structures similar to fishways and spawning channels, respectively.

2.0 Expenditure Breakdowns

Per dollar breakdowns of SEP expenditures on various types of fish production and support activities are presented in tables A.2 to A.8. These tables show, for a $1 expenditure on each type of activity, the percentage attributable to direct wages and salaries and to other goods and services.

TABLE A.2

Per Dollar Breakdown of SEP

Support Expenditures

	Per $ Expenditure Breakdown
Wages and Salaries	.50
Management Services	.26
Travel	.06
Gasoline	.01
Telephone	.02
Truck Rental	.01
Office Equip. Rental	.03
Office Supplies	.03
Repair Services	.01
Office Machines	.02
Service to Buildings	.01
Scientific Supplies	.04
	1.00

TABLE A.3

Per Dollar Construction Expenditure

Breakdown for Large Hatchery

	Per $ Expenditure Breakdown
Wages and Salaries	.28
Truck Transportation	.02
Steel Pipes and Tubes	.14
Accommodation Services	.01
Prefabricated Structures	.02
Custom Metal Working	.07
Non-Residential Construction	.04
Other Engineering Const.	.22
Other Construction Supplies	.03
Residential Construction	.08
Sand and Gravel	.03
Asphalt, Coal Products	.01
Pumps, Compressors	.03
Wire Fencing	.01
Ready-Mix Concrete	.01
	1.00

TABLE A.4

Per Dollar Construction Expenditure

Breakdown for Large Spawning Channel

	Per $ Expenditure Breakdown
Wages and Salaries	.35
Other Construction Supplies	.01
Machinery, Equip. Rental	.18
Accommodation Services	.01
Fabricated Steel	.01
Other Engineering Construction	.22
Office Supplies	.02
Custom Metal Work	.01
Steel Pipes and Tubes	.01
Wire Fencing	.01
Asphalt, Coal Products	.01
Non-Residential Const.	.12
Ready-mix Concrete	.03
Bricks, Tile, Clay	.01
	1.00

TABLE A.5

Per Dollar Construction Expenditure

Breakdown for Fishway

	Per $ Expenditure Breakdown
Wages and Salaries	.44
Machinery, Equipment Rental	.22
Pumps, Compressors	.05
Custom Metal Working	.08
Other Construction Supplies	.16
Hunting Products	.01
Food Supplies	.02
Air Transportation	.02
	1.00

TABLE A.6

Per Dollar Operating Expenditure

Breakdown for Lake Enrichment

	Per $ Expenditure Breakdown
Wages and Salaries	.27
Air Transport	.60
Fish Food	.12
Scientific Supplies	.01
	1.00

TABLE A.7

Per Dollar Operating Expenditure

Breakdown for Large Hatchery

	Per $ Expenditure Breakdown
Wages and Salaries	.53
Travel	.01
Gasoline	.01
Telephone	.01
Management Services	.03
Office Equip. Rental	.02
Truck Rental	.01
Repair Services	.01
Office Supplies	.13
Natural Gas	.01
Fish Bait	.03
Food (incl. fish food)	.11
Lumber	.01
Chemicals	.01
Textiles	.01
Clothing	.01
Electric Supplies	.01
Plumbing Supplies	.01
Scientific Supplies	.02
Boat Parts and Tools	.01
	1.00

TABLE A.8

Per Dollar Operating Expenditure

Breakdown for Large Spawning Channel

	Per $ Expenditure Breakdown
Wages and Salaries	.45
Vehicles	.03
Travel	.01
Gasoline	.04
Lube Oil and Grease	.01
Electric Supplies	.01
Telephone	.01
Office Equip. Rental	.06
Plumbing Supplies	.01
Management Services	.04
Repair Services	.02
Office Supplies	.03
Truck Rental	.01
Fuel Oil	.20
Food Supplies	.02
Lumber	.01
Mineral Products	.01
LPG	.01
Vehicle Parts	.02
	1.00

APPENDIX B

PER DOLLAR BREAKDOWNS OF INCREMENTAL DOWNSTREAM REVENUES AND EXPENDITURES

1.0 Data Sources

1.1 Without Cost Recovery

The overall breakdowns of the commercial wholesale value of SEP production into landed and processing gross margins, respective costs (labour and non-labour) and net income are derived from the SEP Evaluation Model.

Breakdowns of incremental, non-labour harvesting costs were derived from the 1982 MSA study on the basis of 1981 income and expense statements for various types of fishing vessels. It has been argued and observed by economists that due to the common property nature of the fishery, additional income accruing to fishermen is at least partly respent on vessel upgrading and perhaps licenses in order to gain a larger share of the fishery. The current assumption in the SEP Evaluation Model is that 30% of harvesting profits are reinvested in the fishery. This assumption is based on a 1987 survey which examined the relationship between changes in net income and investment behaviour of 100 troll vessels.(1) This survey also developed data on

---

(1) D. Lane, "Investment Decision-Making by Fishermen", University of Ottawa, Discussion Paper 87-20, 1987.

investment expenditure patterns which are incorporated into the breakdown of harvesting revenues in Table B.1.

Incremental, non-labour processing costs were also derived from breakdowns developed in the 1982 MSA study on the basis of Statistics Canada data(1) and information from a previous economic impact study of SEP by Acres.(2) Per dollar breakdowns of harvesting and processing revenues for rack fisheries were developed for this study on the basis of data provided by the Operations Branch of SEP and the Crown Assets Disposal Corporation.

Per dollar breakdowns of SEP-related expenditures by recreational anglers are based on a previous MSA study which estimated the economic impact of resident, tidal sportfishing in British Columbia.(3). The breakdowns shown here represent an average of tidal and non-tidal, resident and non-resident spending patterns weighted by their relative importance in terms of expenditures.(4) Note that these breakdowns do not include expenditures on major capital items such as boats and recreational vehicles. Note also that wages and salaries are

---

(1) Statistics Canada, Catalogue 32-216, 1980 (issue of non-resident and freshwater)

(2) Acres Consulting Services Ltd., "Economic Impacts Associated with the Salmon Industry in British Columbia," 1977.

(3) Marvin Shaffer & Associates Ltd., "The Economic Impact of Resident Sport Fishing in British Columbia, for DFO, 1982.

(4) Source: "Sport Fishing in B.C. Tidal Waters", op. cit.

not reflected directly in the sport fishing expenditures breakdowns, but are embodied in the recreationists' purchases of goods and services.

Existing and full cost recovery scenarios were incorporated into harvesting and processing breakdowns by dividing the appropriate cost recovery revenues associated with each scenario into total estimated SEP-related revenues or expenditures in each of these sectors. Implicit in this approach is that cost recovery will not affect downstream effort, output or expenditures. It is assumed that the commercial harvesting sector bears all existing commercial-related cost recovery charges but that full cost recovery charges are split evenly between harvesting and processing. Note that separate harvesting revenues and sport expenditure breakdowns were developed for the provincial program in order to reflect that no cost recovery charges would be levied.

1.2 Revenue and Expenditure Breakdowns

Per dollar breakdowns of SEP-related downstream harvesting and processing revenues and expenditures are presented in Tables B.1 to B.4. These tables show, for each dollar of commercial revenues or recreational expenditures, the percentage attributable to profits, government revenues, wages and salaries and other goods and services.

TABLE B.1

Per Dollar Breakdown of Harvesting Revenues

Existing Cost Recovery

	Per $ Revenue Breakdown
Wages and Salaries (inc. surplus)	.67
Ships & Commercial Vessels	.11
Electronic Equipment Components	.01
Motor Vehicles, NES	.02
Fuel and Oil	.01
Rapair Services	.01
Nets and Gear	.01
Food Supplies	.01
Government Fees and Licenses	.15
	1.00

TABLE B.2

Per Dollar Breakdown of Processing Revenues

Existing Cost Recovery

	Per $ Revenue Breakdown
Profit/Surplus	.70
Wages and Salaries	.15
Electric Power	.01
Oil, Salt, Spices	.01
Fish Bait	.02
Cartons, Bags, Cans, Bottles	.02
Other Metal Containers	.06
Equipment & Maintenance Supplies	.03
	1.00

TABLE B.3

Weighted Per Dollar Expenditure Breakdown for
Resident and Non-Resident Tidal Sport Fishing
Existing Cost Recovery

	Per $ Expenditure Breakdown
Accommodation Services	.11
Groceries	.09
Other Meals	.08
Water Transportation	.14
Air Travel	.08
Other Travel	.03
Gas	.17
Fishing Supplies	.05
Other Recreational Services	.01
Government Fees & Licenses	.24
	1.00

TABLE B.4

Per Dollar Breakdown of Rack Fishery Harvesting and Processing Revenues

	Per $ Revenue Breakdown
Profit/Surplus	.36
Net Government Revenues	.21
Wages and Salaries	.35
Management Services	.02
Cartons, Bags, Cans, Bottles	.04
Equipment & Maintenance Supplies	.01
Oil, Salt, Spices	.01
	1.00

TABLE B.5

Per Dollar Breakdown of Harvesting Revenues

Additional Cost Recovery

	Per $ Revenue Breakdown
Wages & Salaries (inc. surplus)	.62
Ships & Commercial Vessels	.10
Electronic Equipment	.01
Motor Vehicles, NES	.02
Fuel & Oil	.01
Repair Services	.01
Nets and Gear	.01
Food Supplies	.01
Government Licenses & Fees	.21
	1.00

TABLE B.6

Per Dollar Breakdown of Processing Revenues

Additional Cost Recovery

	Per $ Revenue Breakdown
Profit/Surplus	.53
Wages & Salaries	.15
Electric Power	.01
Oil, Salt, Spices	.01
Fish Bait	.02
Cartons, Bags, Cans, Bottles	.02
Other Metal Containers	.06
Equipment & Maintenance Supplies	.03
Government Licenses & Fees	.17
	1.00

TABLE B.7

Weighted Per Dollar Expenditure Breakdown for Resident and Non-Resident Tidal Sport Fishing Additional Cost Recovery

	Per $ Expenditure Breakdown
Accommodation Services	.10
Groceries	.08
Other Meals	.07
Water Transportation	.12
Air Travel	.07
Other Travel	.03
Gas	.16
Fishing Supplies	.04
Other Recreational Services	.01
Government Fees and Licenses	.32
	1.00

TABLE B.8

Per Dollar Breakdown of Harvesting Revenues

Provincial Program

	Per $ Expenditure Breakdown
Wages and Salaries (inc. surplus)	.70
Ships & Commercial Vessels	.11
Electronic Equipment Components	.01
Motor Vehicles, NES	.02
Fuel and Oil	.01
Rapair Services	.01
Nets and Gear	.01
Food Supplies	.01
Government Fees and Licenses	.12
	1.00

TABLE B.9

Weighted Per Dollar Expenditure Breakdown for Resident and Non-Resident Tidal Sport Fishing Provincial Program

	Per $ Expenditure Breakdown
Accommodation Services	.14
Groceries	.12
Other Meals	.11
Water Transportation	.18
Air Travel	.11
Other Travel	.04
Gas	.22
Fishing Supplies	.07
Other Recreational Services	.01
	1.00

APPENDIX C

Summary of Regional Income Multiplier Methodology

Regional income multipliers estimate the total amount of income[1] generated in a local economy by an initial $1 increase in wage and salary income. They are based on the estimated proportion of a dollar of household income that is retained in the community after each round of respending. The following is a brief description of the multiplier methodology and estimates developed by H.C. Davis in a recent study.[2]

The initial increase in income is defined as the wage and salary income associated directly with the project being analyzed. Further inter-industry spending resulting from other project purchases of goods and services from local suppliers are assumed to generate only negligible income and employment. By determining the amount of local and non-local taxes and other "leakages" such as savings and non-local expenditures, the proportion of the initial income injection which is

---

(1) Income includes all factor payments such as wages and salaries, profits, rent and interest.

(2) Davis, H.C., "Income and Employment Multipliers for Seven British Columbia Regions," Canadian Journal of Regional Science, IX:1, 1986.

spent on local goods and services is estimated.(1) The distribution of local consumer spending by industry, the income content of these sales and the income generated by subsequent rounds of consumer and industry respending are then estimated. It is assumed that each round of consumer respending is subject to the same tax rate, savings rate and other leakages. Inter-industry effects resulting from consumer respending (including local trade and transportation margins on imported commodities) are estimated with the open variant of the lower mainland I-O model(2) scaled down for each sub-region by the ratio of the sub-region's total employment to total employment in the lower mainland. This assumes that the complexity of the sub-regional economy, and therefore the scale of inter-industry effects, is proportional to total employment in the local economy.

The regional income multiplier is expressed as 1/1-r where r is the average amount of income retained locally after each round of spending and is defined algebraically as follows:

---

(1) Feedback effects through increased local government spending, increased local investment and population growth are not incorporated in the multipliers used in this study but have been included in other formulations developed by Davis. For example, see H.C. Davis, "Assessing the Impact of a New Firm on a Small Scale Regional Economy: An Alternative to the Economic Base Model", Plan Canada, September/December, 1976.

(2) See Davis, H.C., "An Inter-Industry Study of the Metropolitan Vancouver Economy", Report No. 6, Urban Land Economics, 1976.

$$1 - (1- t - s) [mt_m (v_i + Ey_i) + (1 - m) \sum_i c_i(v_i + Ey_i)]$$

$$(i = 1, \ldots, n)$$

Where

t = tax rate

s = savings rage

m = proportion of consumption spending on imported goods and services

t_m = trade and transportation margin on imported goods and services

v_i = the income content of sales for each industry i

E = the ratio of employment in each region to that of the lower mainland

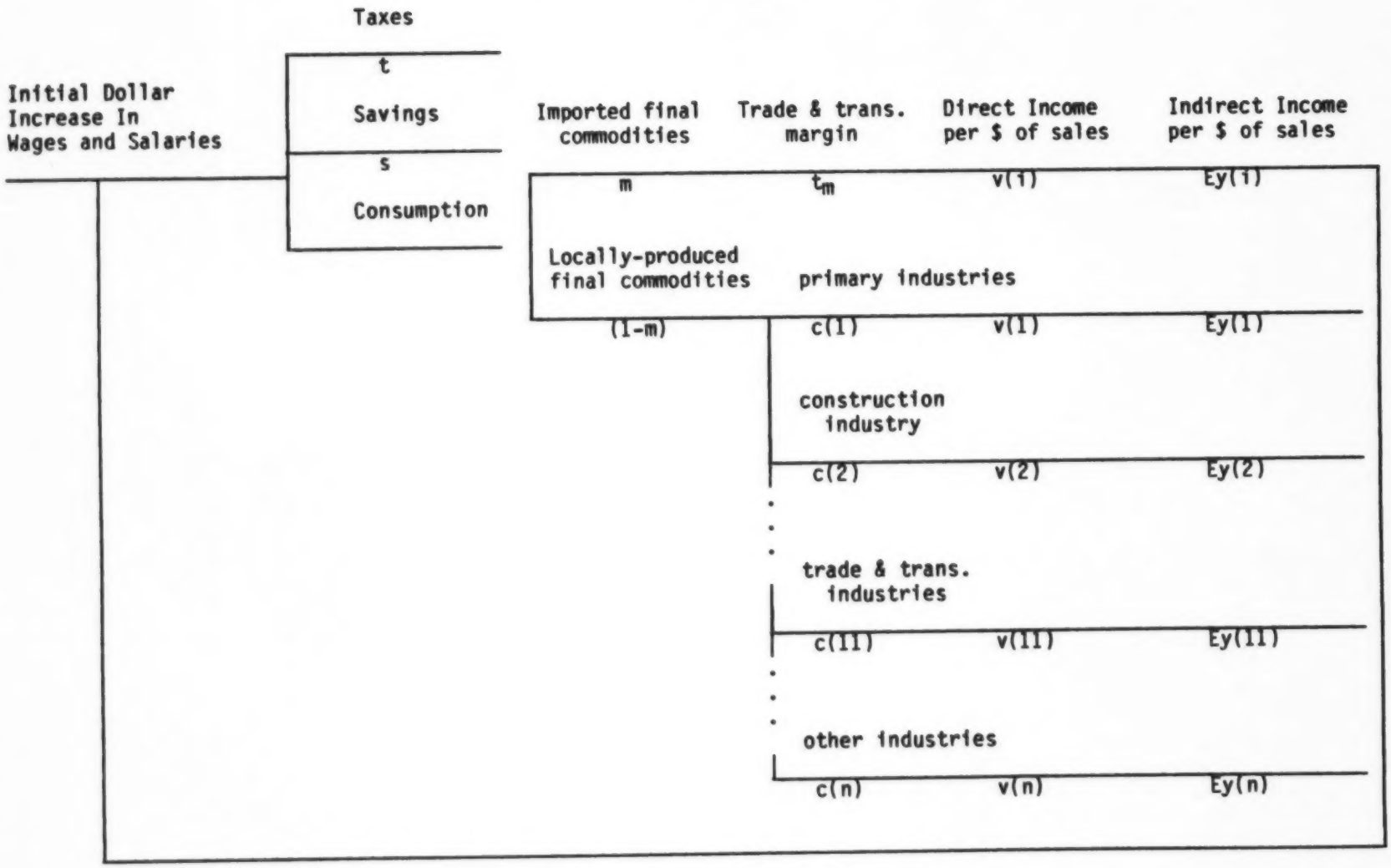
Y_i = the income generated by a dollar of sales in industry i as a result of further rounds of inter-industry spending (derived from estimates by an I-O model for the lower mainland)

$1-m$ = proportion of consumer spending on local goods and services.

c_i = proportion of consumer spending on output of industry i

A schematic outline of the regional income multiplier described above is shown in Figure C.1.

FIGURE C.1


Taxes
t
Savings
s
Consumption
Initial Dollar Increase In Wages and Salaries
Imported final commodities
Trade & trans. margin
Direct Income per $ of sales
Indirect Income per $ of sales
m
t_m
v(i)
Ey(i)
Locally-produced final commodities
primary industries
(1-m)
c(1)
v(1)
Ey(1)
construction industry
c(2)
v(2)
Ey(2)
trade & trans. industries
c(II)
v(II)
Ey(II)
other industries
c(n)
v(n)
Ey(n)

Sub-regional employment impacts are derived from income multipliers, first by estimating the wage and salary content of total indirect income generated by the initial injection of wages and salaries into the region. Employment impacts are then estimated by means of an average wage assumption. Thus, the indirect employment impacts are estimated as:

$$K (Y - 1)/ W$$

Where

K = average ratio of wages and salaries to total income in the sub-region;

Y = total indirect income generated in the sub-region by the initial injection of wages and salaries;

W = average wage in the regional economy.

Based on the above methodology, Davis estimated the following income and employment multipliers for seven sub-regions in British Columbia.

	Income Multiplier*	Employment Multiplier**
North	1.25	46.6
Cariboo	1.19	44.8
Vancouver Island	1.37	50.9
Lower Mainland	1.49	54.5
Kamloops	1.22	46.6
Okanagan	1.27	48.0
Kootenay	1.23	46.0

*Total income per dollar of wages and salaries.

**Total PYs per million dollars of wages and salaries.

The regions for which Davis developed his multipliers were comprised of aggregations of regional districts which were larger than the sub-regions selected for analysis in this study. Multipliers for these larger regions would somewhat overstate spin-off effects for the smaller sub-regions, since consumer spending-related inter-industry effects would be higher in larger regions. This would be particularly true if the larger region incorporates a major consumer goods producing centre which is excluded from a smaller sub-region. On the other hand, much of the sourcing for consumer goods would be from the lower mainland which would be excluded regardless of the definition of the outlying region. A number of other leakages such as taxes and savings are also relatively constant among the various regions. Finally, the Davis multiplier likely underestimates total spin-off effects of a project in a sub-region since it does not incorporate inter-industry effects arising from the non-labour purchases of the project. For these reasons, the Davis multipliers do not vary as much as might be expected with respect to the size of the regional economy. For example, the income multiplier for Kootenay is smaller than the multiplier for the Okanagan by a factor of only 15% (.23 vs. .27) despite the fact that employment in the Kootenay region is 35% lower than in the Okanagan.

Based on these considerations, multipliers for the sub-regions selected for analysis in this study were assumed using the

Cariboo region in the Davis study as an upper benchmark. Given that the size of the selected sub-regional economies do not vary greatly,[1] an income multiplier of 1.15 and an employment multiplier of 44.0 are assumed for all three sub-regions. These multipliers represent only very rough approximations of actual calculated values but do provide a reasonable indication of the order-of-magnitude of spin-off effects at the sub-regional level. Since the same multipliers are assumed for the three sub-regions, regional impacts will vary strictly in proportion to the scale of direct impacts.

---

(1) Employment in the 3 regions ranged from 8,000 to 14,000 in 1981.